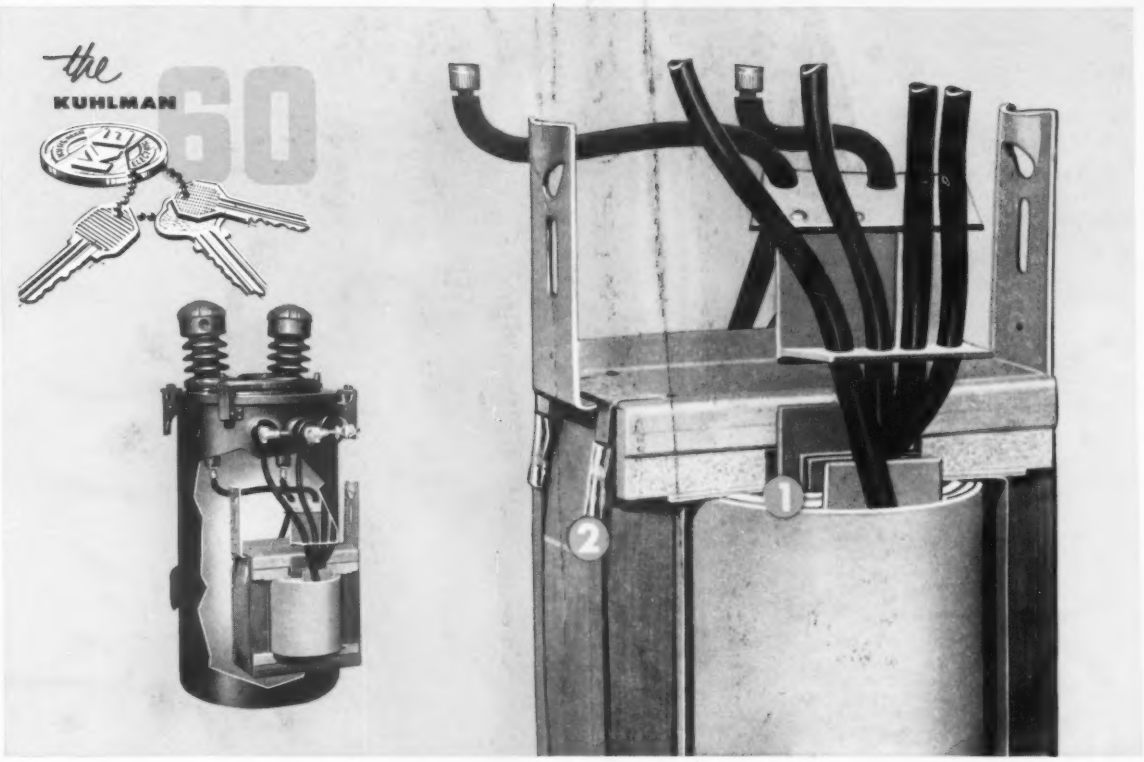
ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

December 1960
50 Cents

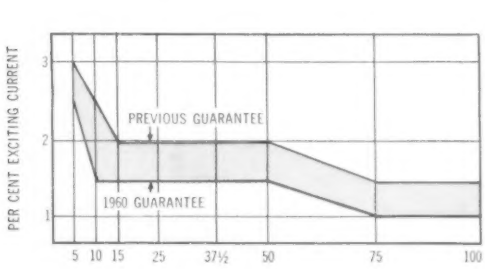


"ALL NEW" Core and Coil Saves Revenue Dollars

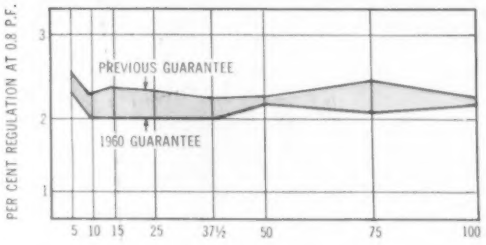
Here are four places to look for new savings in the ALL NEW Kuhlman '60 transformer:

1. *The coil*—mechanically stronger with improved electrical characteristics and an "all new" core that offers more compactness and low copper and core losses. Savings: more transformer for your dollar; less drain per transformer on your system.

2. *The core*—smaller, more efficient with fewer and shorter gaps is designed for minimum local flux concentration and maximum flux flow. Savings: More transformer per pound; more efficiency and operating economy.



3. *Lower guaranteed exciting current*—the result of new Kuhlman '60 efficiency and lower losses—covers all popular ratings as shown above. Savings: Lower exciting current values conserve generating capacity and revenue-producing power.



4. *Better guaranteed regulation*—due to the lower impedance of the new redesigned coil—offers improved regulation in all popular ratings (see above). Savings: The customer gets full power; you get full revenue.

In the face of rising costs, here's one sure way to save revenue dollars. Install ALL NEW Kuhlman '60 transformers. They are more efficient and cost less to operate.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Mich.

Manufacturers of transformers since 1894

Western Division—Salinas, California

editorial views

WE AREN'T PLAYING FOR WALNUT SHELLS

In a July editorial we stated the utility industry would have to make the upgrading of standards a matter of prime importance. Today we would like to place some ballpark numbers on one area of one product where aggressive utility action is needed. The discussion concerns higher temperature rated transformers. The present confusion regarding overrating is a simple statement that the industry has improved technological capability—and is offering it in many forms for consideration.

At a recent seminar of distribution engineers from across the country, the conclusion was clearly reached that the extra capability expressed as dual rating was unusable. The cry was for standardization that would allow the use of the new materials to achieve lower cost.

Manufacturers are chary, but some have indicated a 5% weight reduction—and a like cost saving. This says simply that if we can **make use** of the 65 C rise capability there is a 5% saving that can be enjoyed in the $80 million Western transformer market. That's $4 million—a tidy payoff for precious little effort.

But that's only the beginning. Reliable manufacturers say that they can operate their insulation systems with a 75 C rise with no sacrifice of operating performance. This may be another $4 million sitting on the table. These are the economic facts surrounding the constructive use of one improved material in one product line. It amounts to about 20¢ per peak kw annually from here on out.

To achieve these savings, users will have to take aggressive action directed at standardization in terms of the best equipment that can be manufactured. This has not been done nor is it presently in prospect. In truth, the net effort of users in recent years has been destandardization. Properly oriented standards groups should be leading the manufacturers, even goading them, to produce better low cost equipment. **Not following five years behind. Not accepting minimum standards.**

There is clearly no hesitancy for equipment users in and out of the utility field to be demanding, even uncompromising, with suppliers regarding price. As a result, there is today a massive shift in the end purpose of research dollars from users to produce benefits. **When price is the key to the market, cost is the key in the factory.** This is a reality.

Against this background, standards activities take on even greater importance. We believe each major utility should have a manager of standards and staff to implement his efforts. We believe that ten of the major companies can set a direction that will enable distribution transformer manufacturers to begin passing on sizable economic benefits.

LABOR WON TOO

Let's think through the idea of the G-E victory in the recent strike. It is a victory in that they are back at work. It is a victory in that ten years of scrupulously forthright communications have engendered some feeling of mutual trust. This is an achievement that all industry should note.

It is also a victory for unionism. We would be extremely unjust if we overlooked the wisdom the rank and file union members showed in recognizing that their best interests were better served by their company than a vitriolic union leader. And beyond wisdom, it took raw courage to act. These people have served themselves, their company and this industry—we commend them.

Whether Mr. Carey won or lost is not very important.

"And he shall turn the heart of the fathers to the children, and the heart of the children to their fathers," . . . Malachi IV, 6.

Christmas, 1960. Another generation of tykes will know the only-once joy of "my very own electric train."

So wondrous is this toy that henceforth transformers, switches, motors and the most practical application of Kerkoff's law will be known. Our guess is that every engineer is born on Christmas day.

And the magic of the season is such that every year the hearts of the fathers and the sons become one as we relive that glory morning under the tree—"move over, son, and let dad have a try at the controls."

Our Christmas wish is simply that all of you will share these joys.

Technical Note

This was the most easily come by cover in our polychrome history. The photographer, George Waters, mixed a small boy with a large chocolate malt and a 7-Up. He then added equal parts of red train and pine bough and said, "JD, take that screwdriver and fix the coupling." Click!

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S. Established 1887

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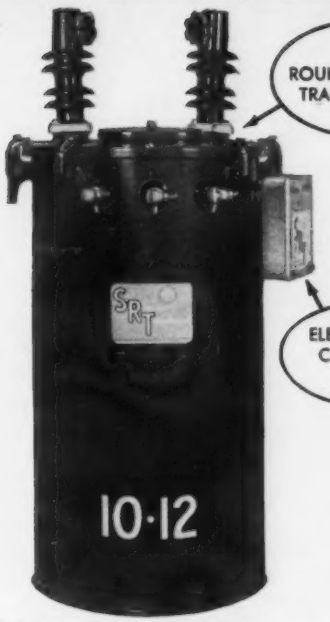
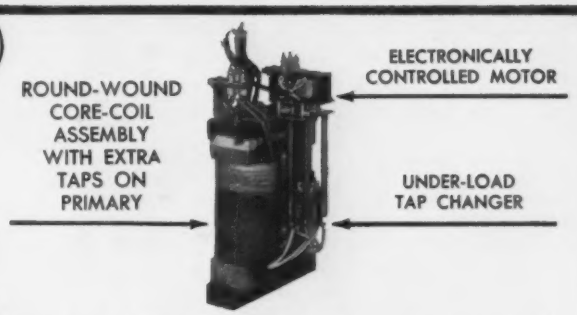


SRT simply replaces conventional transformer where you have a regulation problem. It requires no extra pole space, no additional wiring. Note the new electronic unit—mounted externally where it is not affected by oil temperature changes, and is easily accessible for changing midpoint settings if desired.



Internal view, showing Round-Wound core-coil assembly, and under-load tap changer which is automatically controlled by the electronic sensing unit to regulate the secondary voltage. Midpoint may be set anywhere from 120 to 126 volts; the SRT automatically maintains this voltage within a 3½-volt band width

L-M's Electronic SRT®

Now in Full Production For Immediate Delivery

L-M's exclusive Self-Regulating Distribution Transformer fully tested in actual service for two years. Now new electronic control on the SRT® offers greater flexibility in the field, easier accessibility, longer expected life.

The Self-Regulating Transformer, developed by Line Material and put on the market in limited quantities two years ago, has been highly successful. By regulating right at the point of use, the SRT can solve both low-voltage and over-voltage problems and can provide better service for utility customers. Thus it greatly reduces customer complaints caused by voltage variations. Under most conditions, the SRT is the most economical means of voltage correction. In addition, extensive utility tests have proved the SRT reliable and efficient.

How the SRT Operates

The SRT requires no additional pole space, no extra wiring. Instead, the SRT contains, in one tank, a distribution transformer with extra taps on the primary, a regulating mechanism that is volt-sensitive on the secondary, and an automatically operated under-load tap changer on the primary. As secondary load fluctuates, the tap changer switches primary turns in or out to keep secondary voltage within a 3½-volt band width around a predetermined 120 to 126 volt midpoint.

Now With New, Field Tested Electronic Control

The SRT was originally equipped with a hydraulic operating unit that proved extremely dependable and accurate. Further work by L-M research engineers has resulted in an electronic solid state control that thorough field testing shows is not only exceedingly accurate, but also completely flexible. It may be adjusted to any desired mid-point voltage while the transformer is operating without the use of instruments.

Since the electronic unit is external to the tank, its components, therefore, are not affected by high oil temperatures associated with transformer loading. In addition, the total absence of moving parts assures life expectancy comparable to that of the transformer without need for periodic inspection.

Get Complete Details on SRT

Ask your L-M Field Engineer to show you reports from utility companies having extensive experience with the SRT, and details on its operation and application. Or write Line Material Industries, Milwaukee 1, Wisconsin.

YOU BE THE JUDGE OF SRT VALUE

Ask the L-M Field Engineer to present the evidence of value of the cool-running Round-Wound® Transformer, and the great new Electronic control. Then you be *the judge!*

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Distribution Transformers

McGRAW EDISON

478

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING · LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE & CONDUIT

Today's purchase of each General Electric I-60 provides . . .

Up to 83¢ in EXTRA VALUE by

Each General Electric single-phase meter with magnetic suspension put in service today can save you up to $0.83 in present worth, $1.98 in gross maintenance costs over 15 years . . . here's proof:

Ball bearings in ordinary meters wear, causing loss of accuracy and revenue. Replacement—in a comparatively short time—is necessary for efficient, economical operation. *Bearing replacement is costly.*

Here's a typical example. Assume replacement occurs after 15 years' service. Then, consider these replacement maintenance costs: $0.90 per meter, net cost for parts; $0.33 per meter, average labor cost; $0.75 per meter, average cost for handling and recalibrating. *These replacement costs total $1.98 per meter.* Using a present worth factor of six percent interest for each of the 15 years, the conservative cost of bearing replacement on each ball-bearing meter would be $0.83.

General Electric single-phase—and polyphase—meters with magnetic suspension have *no bearings to wear out or replace*—no measurable bearing wear after the equivalent of 300 years of normal service. In fact, of nearly 12,000,000 G-E magnetic suspension meters now in service, not one has ever been replaced because of bearing wear. This is proved reliability.

Now, multiply the $0.83 figure calculated by the number of ball-bearing meters you have in service . . . and see why, *in metering, anything less than the best is too costly.*

For additional information, contact your General Electric Sales Engineer. Or write General Electric Co., Somersworth, N. H. 713-03

In metering, anything less than the best is too costly

Present Worth Savings From No Bearing Wear

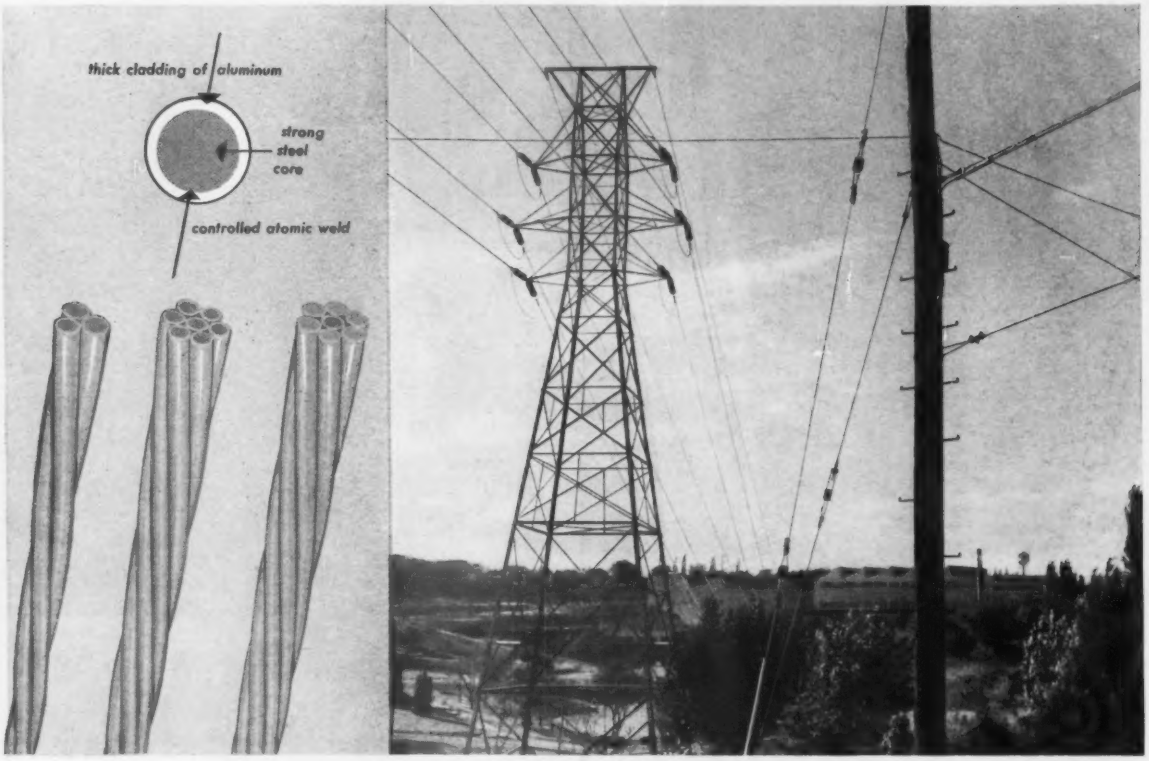
Eliminating Bearing Replacement

METER DEPARTMENT

GENERAL ELECTRIC

The *Alumoweld technique* of welding aluminum to steel

means TOP PERFORMANCE... LONG LIFE... LOW COST



• You cut costs and assure top performance of your overhead lines when you use Alumoweld for overhead ground wire, guys, messengers, and ACSR core wire • You'll have no maintenance worries because a thick cladding of pure aluminum permanently protects Alumoweld's high-strength steel core from corrosion. In fact, Alumoweld has the same corrosion resistance as solid aluminum wire—and 33% of the electrical conductivity. Compared to steel, Alumoweld has three times the conductivity . . . is 18% lighter . . . just as strong . . . and will last far longer.

For overhead ground wire, Alumoweld is tops. The high strength-to-weight ratio permits stringing with smaller sags, thus increasing the mid-span clearance. Its excellent conductivity quickly discharges transient currents to ground—reduces service interruptions.

For guys and messengers, Alumoweld gives long, trouble-free life because it cannot rust. And it's strong and easy to install.

For core wire in ACSR Conductors, Alumoweld eliminates the danger of electrolytic action because it is compatible with solid aluminum wires. It coordinates the life of the strength members with that of the conductor members.

Get all the facts on this low-cost wire and strand by writing today for bulletin E.D. 3000.

ALUMOWELD

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION, GLASSPORT, PA.

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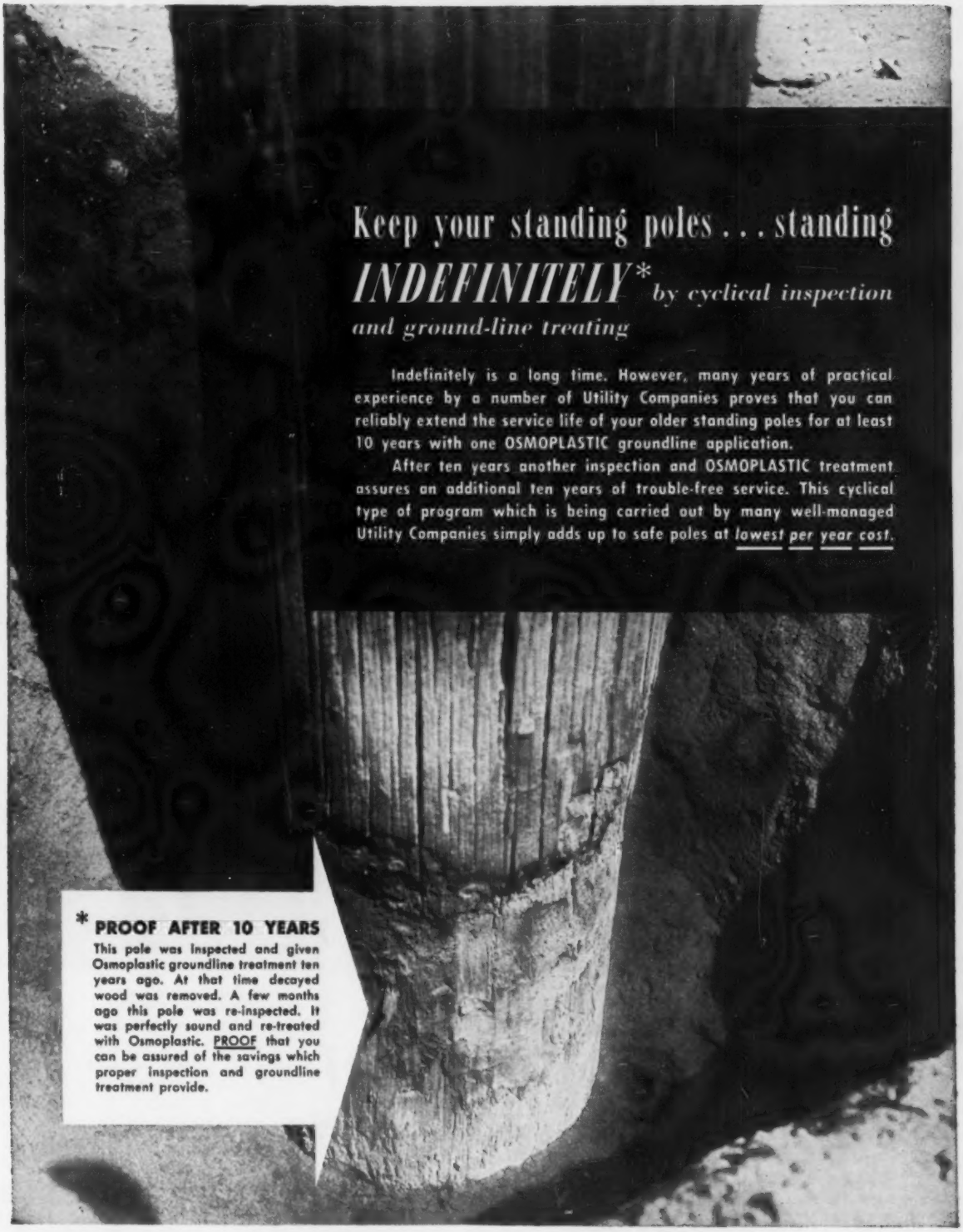


Keep your standing poles . . . standing *INDEFINITELY** *by cyclical inspection and ground-line treating*

Indefinitely is a long time. However, many years of practical experience by a number of Utility Companies proves that you can reliably extend the service life of your older standing poles for at least 10 years with one OSMOPLASTIC groundline application.

After ten years another inspection and OSMOPLASTIC treatment assures an additional ten years of trouble-free service. This cyclical type of program which is being carried out by many well-managed Utility Companies simply adds up to safe poles at *lowest per year cost.*

*** PROOF AFTER 10 YEARS**

This pole was inspected and given Osmoplastic groundline treatment ten years ago. At that time decayed wood was removed. A few months ago this pole was re-inspected. It was perfectly sound and re-treated with Osmoplastic. PROOF that you can be assured of the savings which proper inspection and groundline treatment provide.

In 15 years we have treated over two million poles without one dissatisfied customer.

DAN KAMPHAUSEN CO.

CONTINENTAL OIL BLDG., DENVER 2, COLORADO

New Allis-Chalmers transformer plant...

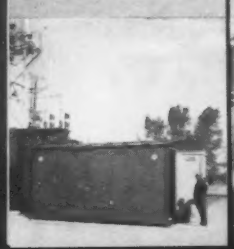
best in industry!

TERRE HAUTE.. TRANSFORMER — OIL CIRCUIT BREAKER — SWITCHGEAR PLANT...

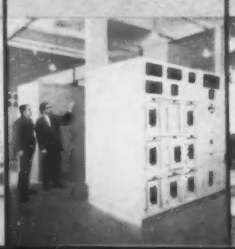
includes a three-million-volt impulse generator and a 600,000-volt high potential test transformer installed in the transformer assembly building. These test facilities represent a 2½-million-dollar investment of the very latest design with maximum flexibility for testing all types of electrical equipment. The three-bay tank and plate shop contains some of the largest equipment in the industry — shot-blast room, 1000-ton forming press, 400-ton straightening press and a shear capable of cutting 1-inch-thick steel.

TYPICAL TRANSMISSION AND DISTRIBUTION EQUIPMENT MANUFACTURED AT TERRE HAUTE

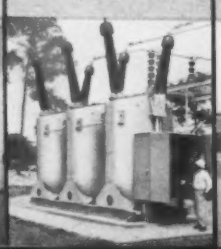
Walk-in-aisle multi-circuit substation



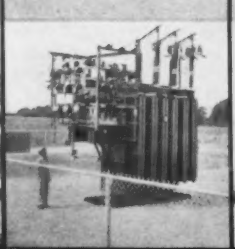
Low-voltage central-station auxiliary switchgear



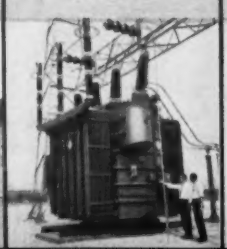
230-kv, 10,000-mva power circuit breaker



Power-Pac suburban substation



138-kv, 15,000-kva power transformer



Single-circuit substation

West bay of the 130,000-sq-ft transformer assembly and test building showing transformers in various stages of manufacture. At right is the vacuum drying tank, one of the largest in the industry. Vacuum as low as 10 mm of mercury can be obtained . . . for efficient drying of transformers.

The industry's finest facilities for designing, building and testing power transformers are housed in the Allis-Chalmers Terre Haute Works. This investment features over 740,000 square feet of floor space. All product design and test developments are closely coordinated with five major Allis-Chalmers plants at West Allis, Wis., Pittsburgh and York, Pa., Gadsden, Ala., and Boston, Mass. These plants produce a complete range of generation, transmission and distribution equipment for industries and utilities.

The Terre Haute Works is typical of Allis-Chalmers look-ahead philosophy that has pioneered so many industry "firsts" in all phases of electrical generation, transmission and distribution. Also an integral part of this plant are the advanced facilities for building and testing oil circuit breakers and switchgear. *Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

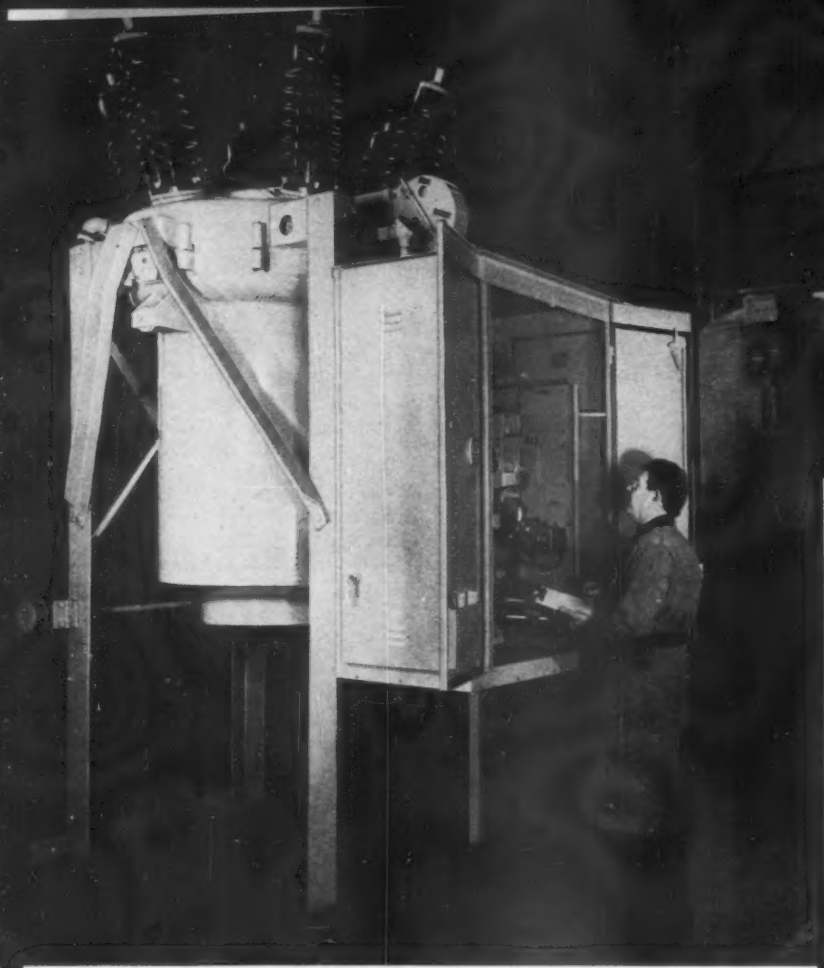
ALLIS-CHALMERS

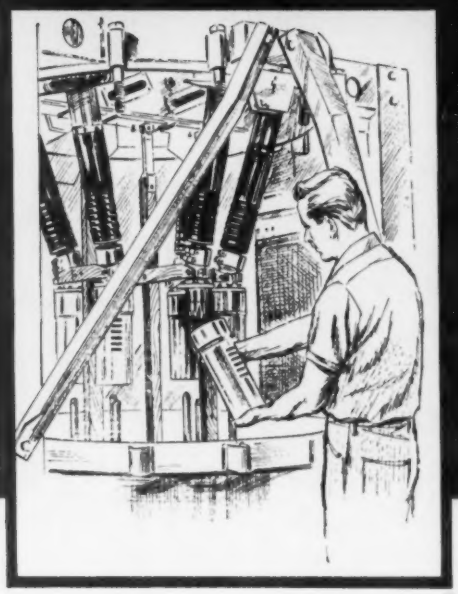
Pacing Power Progress

Shipment of Allis-Chalmers power transformers on railway spur line flatcars indicates the varied size and application range of these Terre Haute products.

A-1390

20,000-kva mobile transformer





NEW I-T-E TREND-LINE BREAKERS SET THE PACE FOR SUBSTATION ECONOMIES

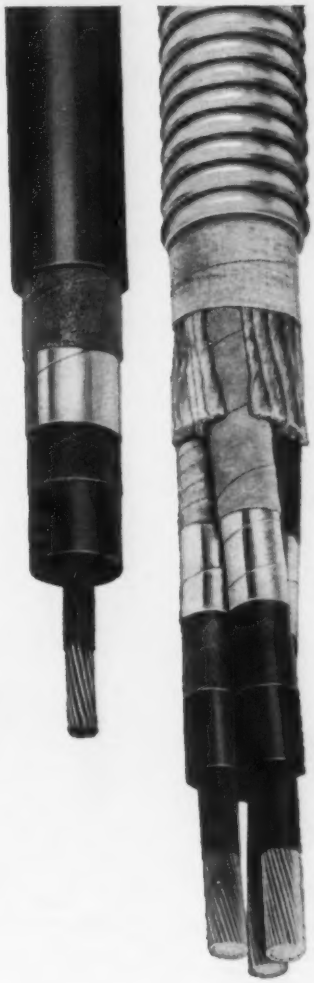
- **Only One Tank to Lower**
- **Easy Access to all Internal Parts**
- **From 30 to 80 Gallons Less Oil**
- **Saves 20% Maintenance Time**

I-T-E, the foremost U.S. manufacturer of switchgear and power interruption equipment, announces an exciting new line of outdoor power circuit breakers—the I-T-E TREND-LINE. Now, substations may employ single-tank breakers in subtransmission ratings with complete confidence in the reliability and performance.

Incorporating a new KOOL-ARC vertical interrupter, these breakers deliver 5-cycle interrupting time as standard performance. Although all phases are contained within a single steel tank, adequate clearance and special tank liners and phase barriers ensure equal or better protection than that afforded by three-tank designs. The new single tank can be easily dropped by one man using an electric tank lifter. With only one tank to service and maintain, substation economies are realized that were previously impossible with the old three-tank designs.

For descriptive literature on the I-T-E TREND-LINE, write to 1667 North Main Street, Los Angeles 12, Calif., Dept. EWE-960-3.

I-T-E CIRCUIT BREAKER COMPANY
KELMAN POWER CIRCUIT BREAKER DIVISION



how good should power cable be

...*for long term stability?*

It isn't enough to meet or barely surpass specifications—not when it is possible to build maximum performance into power cable—as Circle does. Take, for example, the IPCEA-NEMA 60 cycle water absorption test.

Circlesheath® Type RR Power Cable Performance

In the IPCEA-NEMA "Accelerated Water Absorption Tests," Section 6.9, a sample of power cable is immersed in 50°C water for a period of 14 days during and after which time specific inductive capacity and stability factor are measured.

Not only does Circle butyl-insulated power cable far surpass all minimum specifications after 14 days immersion—*but continues to do so after one year and eight months of continuous immersion. And the test is still going on!*

Date of original immersion: September 1958 Date of last test: April 1960

CABLE DESCRIPTION: 15KV, UNGROUNDED, SHIELDED	CIRCLESHEATH® CHANGE SIC	PERFORMANCE STABILITY FACTOR
700,000CM	4.3%	.6%
300,000CM	3.9%	.5%
300,000CM	3.6%	.4%

IPCEA-NEMA Requirements: Change SIC 1 to 14 days: 5% max.—stability factor after 14 days: 1% max.

The manufacture of high-reliability power cable is no accident. It requires expert knowledge of compounding techniques, absolute quality control—and production men who not only care enough . . . but *know enough* to produce the very best.

Circle CIRCLOC® Interlocked Armored Cable combines flexibility with mechanical protection in one lightweight, economical construction. It trains easily over obstructions; is ideal for future plant expansion. Available in galvanized steel, bronze or aluminum armor—from 600 to 15,000 volts.

CIRCLE WIRE & CABLE
a subsidiary of
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RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE •
PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE® EMT

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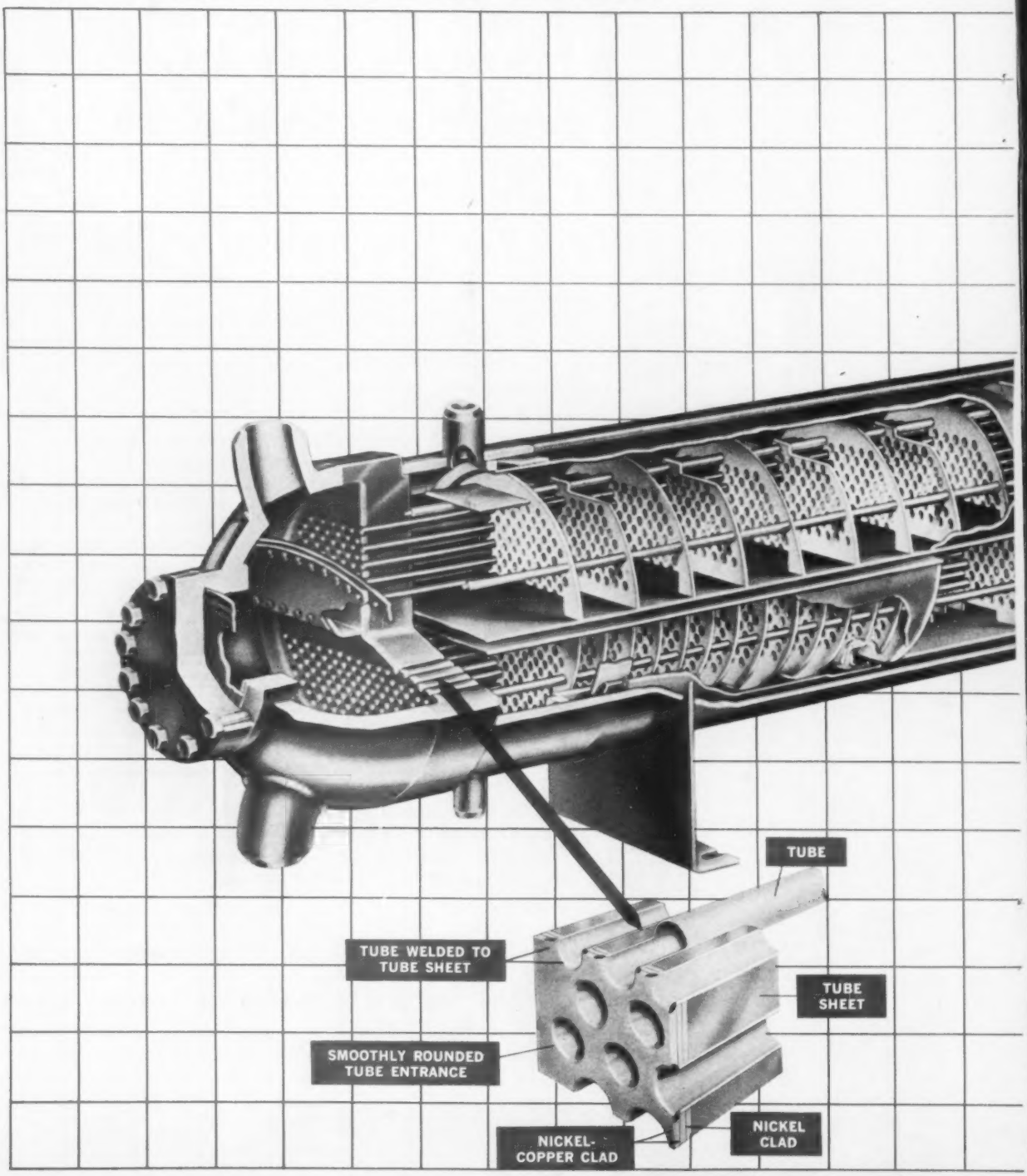
WESTINGHOUSE HIGH PRESSURE FEEDWATER HEATER

with hemispherical head* / Maintenance-free operation with all-welded

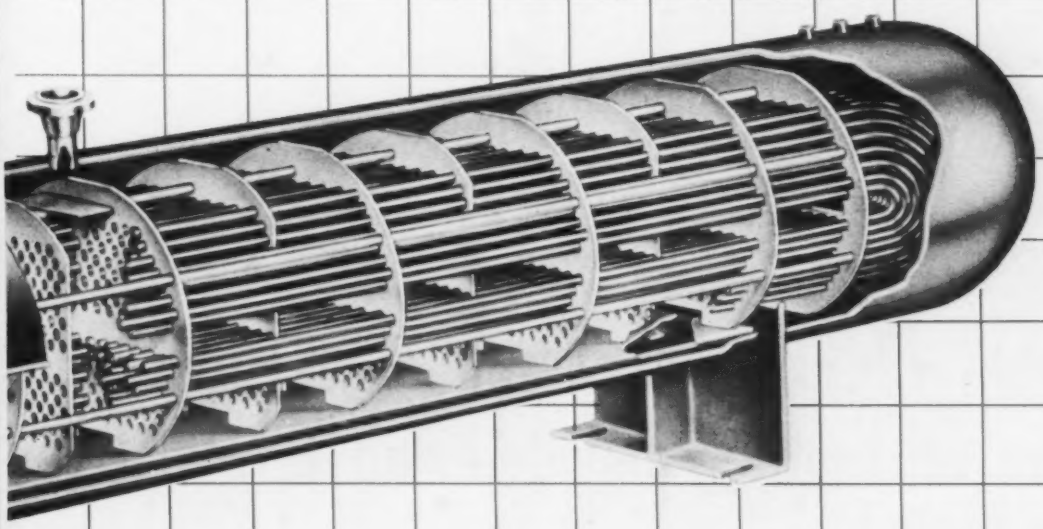
*hemispherical head—best possible chamber design for high pressure feedwater heaters.



design / Leakproof tube joints with tube sheet overlay and welded tubes.
You can be sure . . . if it's Westinghouse.

Westinghouse

J-50620



Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE

One of American Airlines' fleet of Boeing 707 jet flagships parks at new passenger terminal. Neoprene jacketing protects 68,500 feet of underground lighting cable serving the terminal's apron.

Dependable neoprene jacketed cable lights the apron of another new Idlewild terminal

Marshy soil at New York International Airport poses special problems for underground power cable. Excessive moisture that collects in ducts makes life tough for ordinary jacketing. That's one reason why neoprene jacketed cable has been a standard at Idlewild for years. One of the most recent installations is at American Airlines' new jet-age passenger terminal. Here all underground lighting cable serving the terminal apron is protected with durable neoprene jackets, specially compounded for maximum water resistance.

Neoprene jacketed cable has thoroughly proved itself at Idlewild, as elsewhere. Just in the last two years, over 500,000 feet of neoprene cable has been installed during construction work at other Idlewild terminals . . . and all this is in addition to the uncounted millions of feet that have been buried at Idlewild since the airport's inception in 1942.

Neoprene jacketing's proven resistance to weathering, abuse, temperature extremes, flame, hot and cold flow can mean economical *long term* protection for the cable you use. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. ET-12, Wilmington 98, Del.

Free—Du Pont's new WIRE AND CABLE CASEBOOK

Each issue contains case histories from the electrical industry on the use of neoprene jacketed cables. Subscriptions free on request.

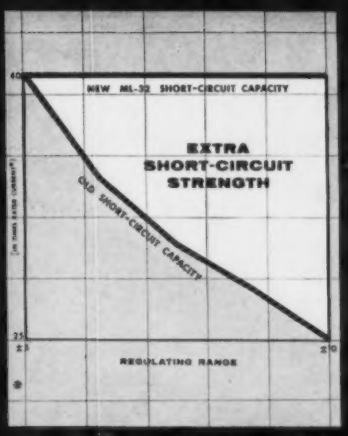
DU PONT REG. U. S. PAT. OFF.

NEOPRENE
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*

For phone number of closest representative see advertising index in back of book.

SEVEN STEPS AHEAD IN VOLTAGE REGULATION



1 Increased short-circuit strength for longer regulator life

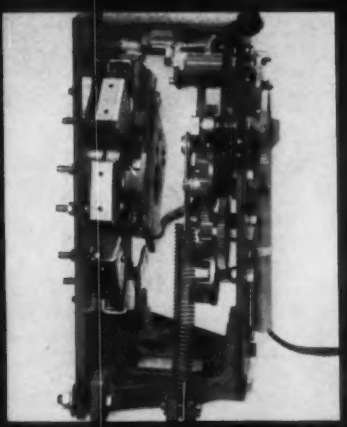
2 New Melalast cover finish increases protection against outages

3 New positive neutral indication protects linemen and equipment

4 Computer studies prove reduced bandwidths increase system earnings

5 Cyanoethylated coil insulation boosts reliability, lengthens life

6 New counter proves no increased operation at reduced bandwidth



7 Controlled switching speed maximizes contact life

1960 innovations emphasize General Electric leadership in voltage regulation

Watch for more to come in '61. Meanwhile, ask your G-E sales engineer for complete information about the full line of General Electric voltage regulators. Or, write General Electric Company, Section 456-6, Schenectady 5, N. Y. *Voltage Regulator Product Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

All your kitchen appliances will be clean, cool electric appliances in a Medallion Home

An all-electric kitchen is just one of the advantages you'll find in a home bearing the Medallion Home award

Every Medallion Home guarantees you:

1. An all-electric kitchen, with major electric appliances such as a modern range and oven ... all part of the basic home plan and price.

2. Full Housepower wiring for present, and future needs to handle the appliances you own today *plus* those you'll want tomorrow.

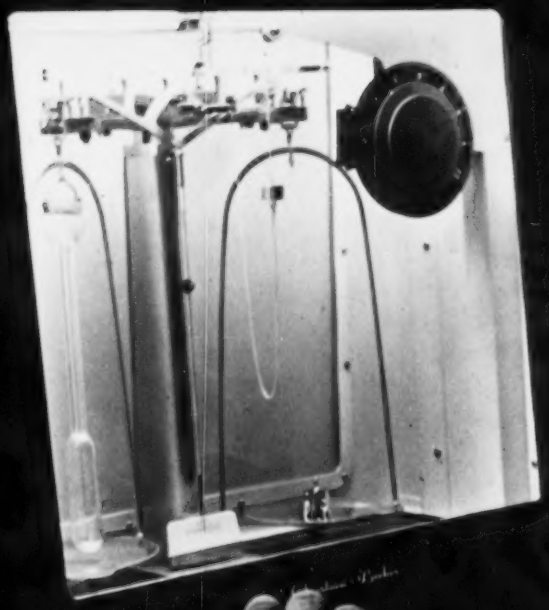
3. Provisions for proper lighting in all areas where it's needed to insure your family's safety and comfort.

And, for the ultimate in luxury living, there's the **all-electric** home—the Gold Medallion Home with a modern electric heating system such as the amazing electric heat pump that both heats *and* cools.

Always remember ... look for the Medallion award before you buy *any* new home.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

RESEARCH AND DEVELOPMENT AT MOLONEY



the Policy...

Our business is more than the production of transformers. It is to provide SOLUTIONS TO transformer PROBLEMS.

Our objective is to demonstrate that—Moloney Electric Company provides flexible, expert and prompt service in finding solutions to specific problems of transformation—solutions that:

- Answer the needs of changing and growing utility loads.
- Keep transformation costs, including installation and maintenance, below the upward trend of general cost increases.
- Eliminate every possible element of economic waste.
- Give every person responsible for transformer purchase or performance an assurance of standards he can count on. To make each person say to himself, "I want Moloney to assist in solving my transformation problems."

This policy and our experience, resources and personnel make Moloney Electric uniquely qualified to serve utilities in every phase of transformation research, development, design and production.

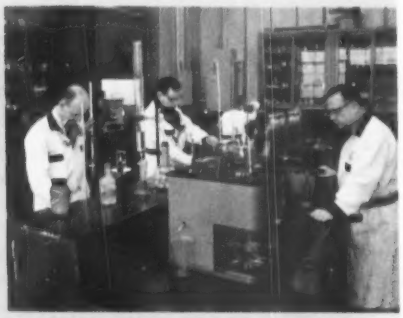
MOLONEY ELECTRIC

Research and Development at Moloney:

The manpower and expense budget for research and development at Moloney is not assigned on a predetermined percentage-of-sales or other formula. The resources in men and money for this essential work are determined in the light of our fundamental policy to lead in transformer improvement and to achieve specific results for customers with particular problems.

Five standing committees of key management and technical executives—including a Program Direction Committee, of which the President and Chairman of the Board are members—set specific and practical goals for research and development projects and keep problems and progress under constant review.

the people . . .



The people of our Research and Development Department are the nation's most specialized technical group in the transformation field. A staff of graduate electrical, mechanical and chemical engineers—specialists in every phase of transformation technology—is constantly employed in engineering design, research and development.

The consultant services of the nation's ablest independent experts, both academic and industrial, in every phase of theoretical and applied research relating to electricity are continuously available to Moloney staff researchers. These experts are on year-round retainer and are present in the Engineering Department on a regular basis.

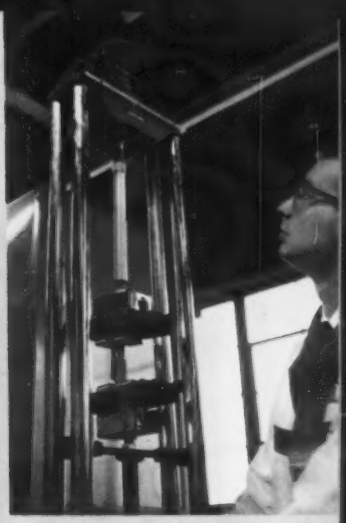
MOLONEY ELECTRIC

MOLONEY

Manufacturers of Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES

the problems . . .

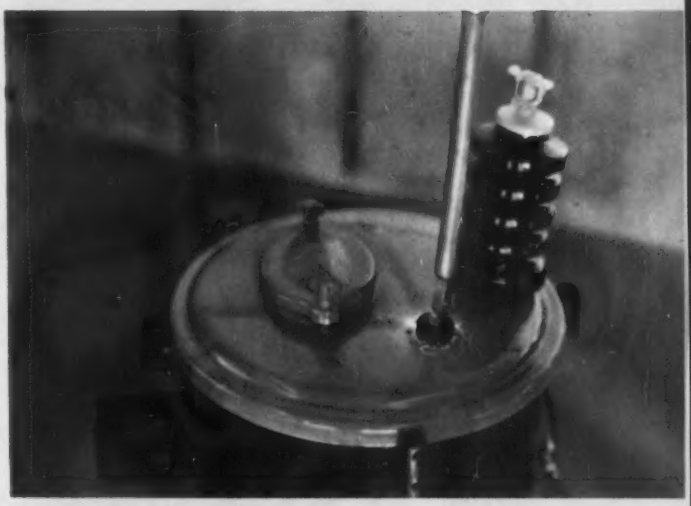


Every theoretical or practical idea that appears to be related to better transformation is subject matter for thorough, constant and programmed study: chemical compatibility of materials, magnetics, electrical characteristics, insulation, heat transfer, sound, mechanics —in all these and other fields, systematic investigations and experiments—keyed directly to transformer performance—lead to improved transformation through better materials and better design.

As major electric utilities are, in increasing numbers, setting up their own departments of research and development, Moloney Electric's research is ever more closely geared to specific projects and goals suggested by individual customers.

Moloney Electric's emphasis on the importance of research and development has been recognized by major corporations that produce materials for transformer manufacture. These suppliers work cooperatively with Moloney in research that has produced significant product improvements and now promises a number of basic forward developments.

Contributions of Moloney research people benefit not only customers and suppliers, but the entire electrical industry. Currently we are taking part in the joint AIEE-NEMA program to develop an accelerated, functional, life testing method for distribution transformers, and to establish a new loading guide.



E L E C T R I C C O M P A N Y

for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Moloney Electric has played a leading role through every important step of progress in transformation. Moloney developed the first three-wire transformer and was the first to use silicon steel for cores. Some of the recent accomplishments of Moloney Electric's research and development programs are . . .

Automatic Testing of Distribution Transformers . . . a patented system eliminating the element of human error from transformer testing.

Corrosion Resistant Tanks . . . made of special aluminum alloys to prevent deterioration of the metal under extreme corrosive conditions.

Moloney Core . . . a new Distribution Transformer core design, reduces losses, exciting current and sound levels.

Corrugated Network Tanks . . . the first continuously corrugated network transformer tanks.

Duratherm Insulation . . . a new high temperature insulation permits operation at increased KVA, or increases transformer life expectancy.

SR New Core Steel . . . the application of a special new core steel makes possible a significant reduction in power transformer sound levels.

"Distributionized" Power Transformers . . . 15 KV, 3 phase transformers, 1500 KVA and below, designed using distribution BIL and without the usual accessories. The result is a smaller, lighter transformer without a sacrifice in performance or overload capabilities.

138 KV Terminal Chamber . . . a special two-compartment terminal chamber to terminate high pressure pipe type cable and positively isolate cable oil from the transformer in the event of a cable leak.

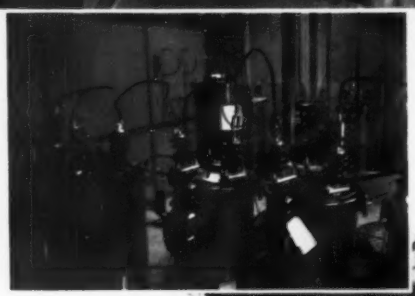
Double-Circuit Integrated Substation . . . a complete substation assembly including LV switching equipment, LTC, line dead-ending provision, etc., for economically serving outlying areas.

Unitran . . . single and three phase pad-mounted transformers for use on underground distribution systems.

Reactor By-pass Switching . . . an exclusive, patented LTC principle affording savings in maintenance and operating expenses.

All-aluminum Power Transformer . . . a 3750 KVA unit having all metal components, except the core, made of aluminum.

Duracoat . . . a new, weather resistant, high dielectric coating for distribution transformer covers.



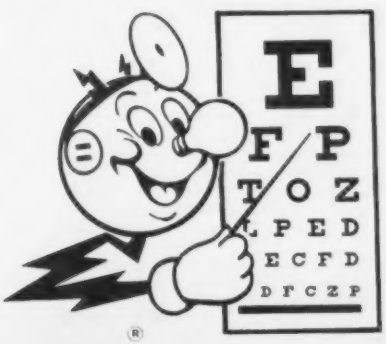
MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES

ME60-25 LITHO IN U. S. A.

Reddy says: Are tired eyes costing your office?

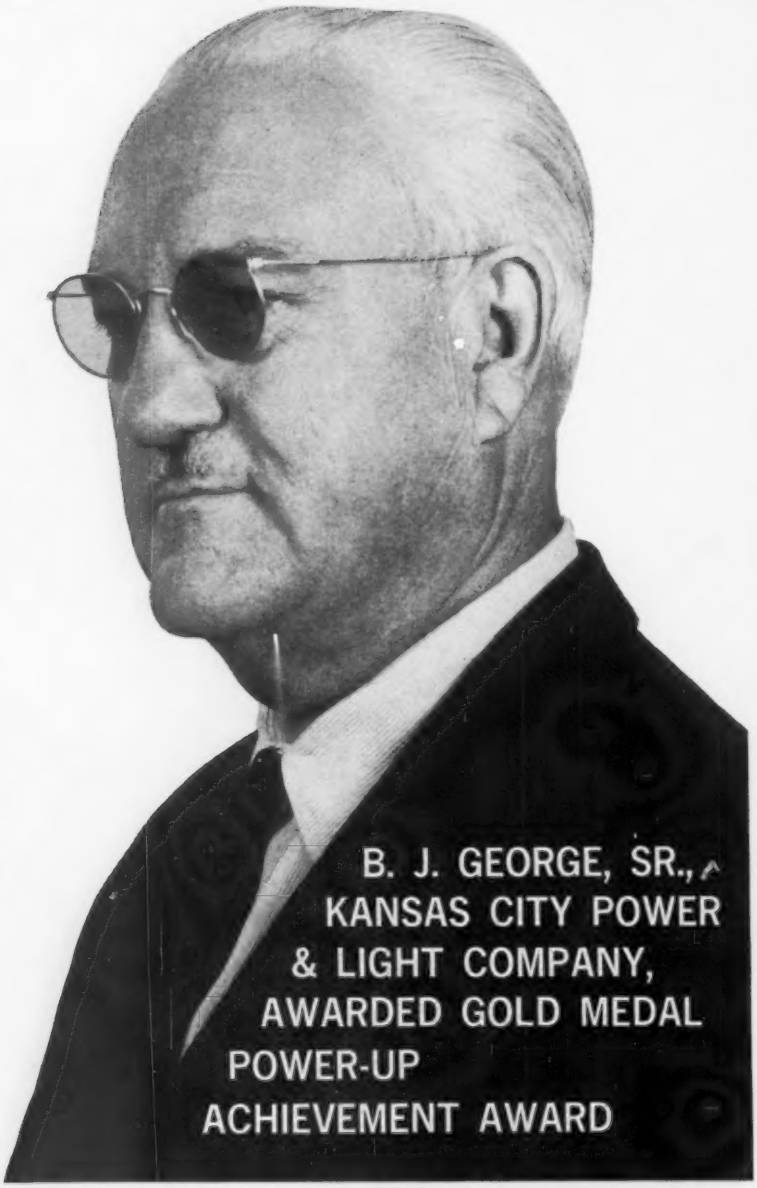


Tired eyes are often the cause of slow and sloppy work. Is your office guilty of gloom-and-glare, shadows and "hot-spots" of light? Efficient lighting should be balanced . . . soft and even everywhere. When it is, eyes see faster (and people work better and more easily). Morale goes up—mistakes, down.

A PG&E Lighting Engineer will be glad to show you various ways to improve your office lighting. Phone the nearest PG&E office for this free service. For your complimentary copy of "Recommended Levels of Illumination" for industrial and commercial establishments, write Northern California Electrical Bureau, 1355 Market St., San Francisco 3.

NORTHERN CALIFORNIA ELECTRICAL BUREAU

this message sponsored by **P·G and E·**
Pacific Gas and Electric Company



POWER-UP
Achievement
Award

Increasing load on a customer's 1925 d-c generating plant posed a difficult problem for Mr. B. J. George, Sr., Kansas City Power & Light Company consultant. Should additional d-c capacity be provided . . . or new a-c generating equipment installed? Should all major load power be purchased? Should steam or electricity be used for air conditioning? Mr. George's solution earned him the Gold Medal Power-Up Achievement Award.

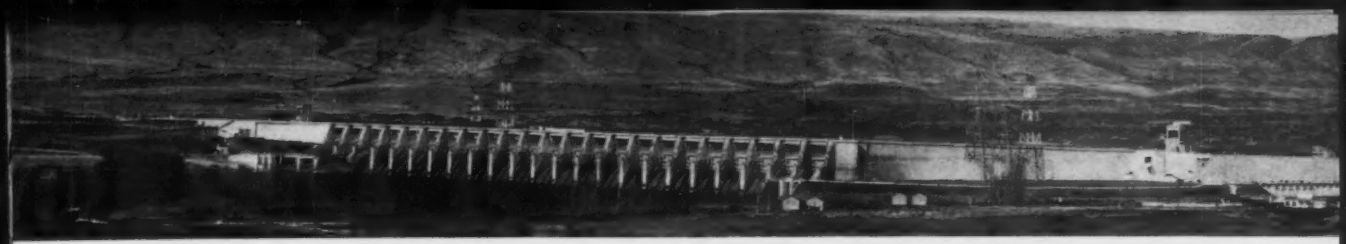
Working closely with the customer, consulting engineers, contractors and fellow employes, Mr. George recommended all purchased power except for boilers to provide building and water heating. Four substations were installed, along with a new a-c distribution system to serve lighting, small motors, office equipment and the conversion of loads to the new system. The customer now has ample provision for future load growth.

Bronze Medal Power-Up Awards were won by Raymond J. Bergmann, The United Illuminating Company (New Haven, Conn.); William J. Carkeek, Puget Sound Power & Light Company (Bellevue, Wash.); William F. Doherty, Union Electric Company (St. Louis, Mo.); Louis E. Krieg, Jr., Pennsylvania Power & Light Company (Allentown, Pa.); Bernard M. Lyons, The Cleveland Electric Illuminating Company; Paul H. Rickert, Metropolitan Edison Company (Reading, Pa.). The awards were based on the sum total of each man's effort, including the results to the customers, the extent of cooperation within the Power-Up teams and that gained from architects, consultants, contractors and manufacturers.

The seven award winners typify the power sales engineers who perform a vital role in helping America increase productivity through electrification. The Power-Up Achievement Awards are presented annually in recognition of outstanding service to industry. Power-Up is a program of electrical service sponsored by the Westinghouse Electric Corporation. **You can be sure . . . if it's Westinghouse.** J-97251

Westinghouse

For phone number of closest representative see advertising index in back of book.



At Oregon's Columbia River Dalles Dam

SPANG® Steel Conduit gets 50-year assignment

in U. S. Corps of Engineers Project Building

The U.S. Corps of Engineers designs and builds on a 50-year life basis. This calls for top-quality materials in every project. Because Pitman Electric Company, electrical contractors on the job, knew dependable SPANG HD Galvanized Conduit and SPANGLEAM EMT would meet these specifications, SPANG was used throughout the Corps' new project building for electric heating, lighting and general power.

SPANG uniformity pays off!

Pitman foreman Bert Bixby reported a smooth installation with SPANG, which was due to the conduit's uniformity. The finish held up perfectly on 90° and "horseshoe" bends. Despite outdoor storage, there was no sign of corrosion on the conduit. Inventory and housekeeping was easier with the special safety bundling of SPANG Conduit packages.

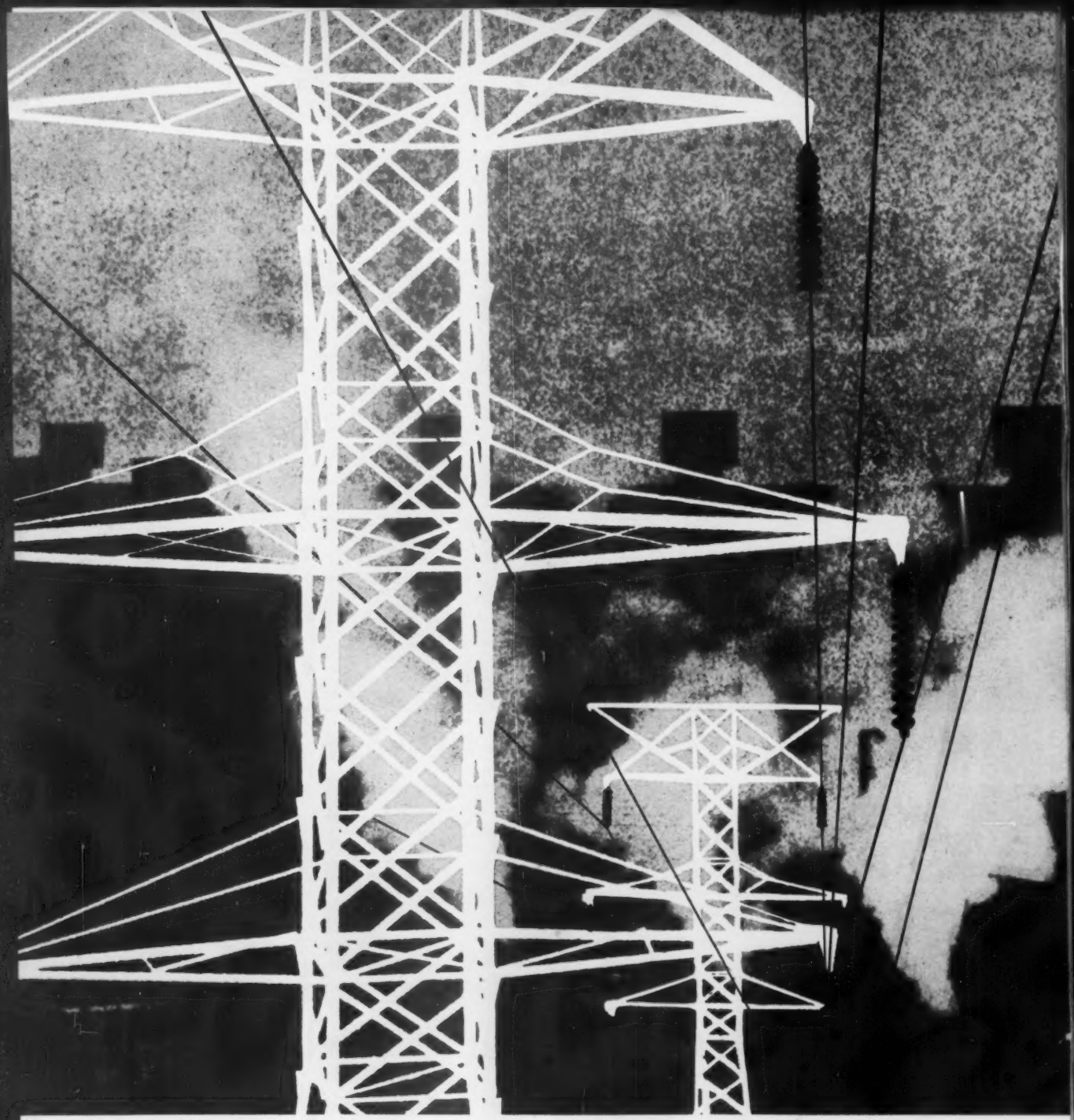
Want dependability? Specify SPANG!

You'll get a trouble-free job with years of built-in dependable service with a SPANG Steel Conduit installation. Next time, tell your local distributor to make it SPANG!

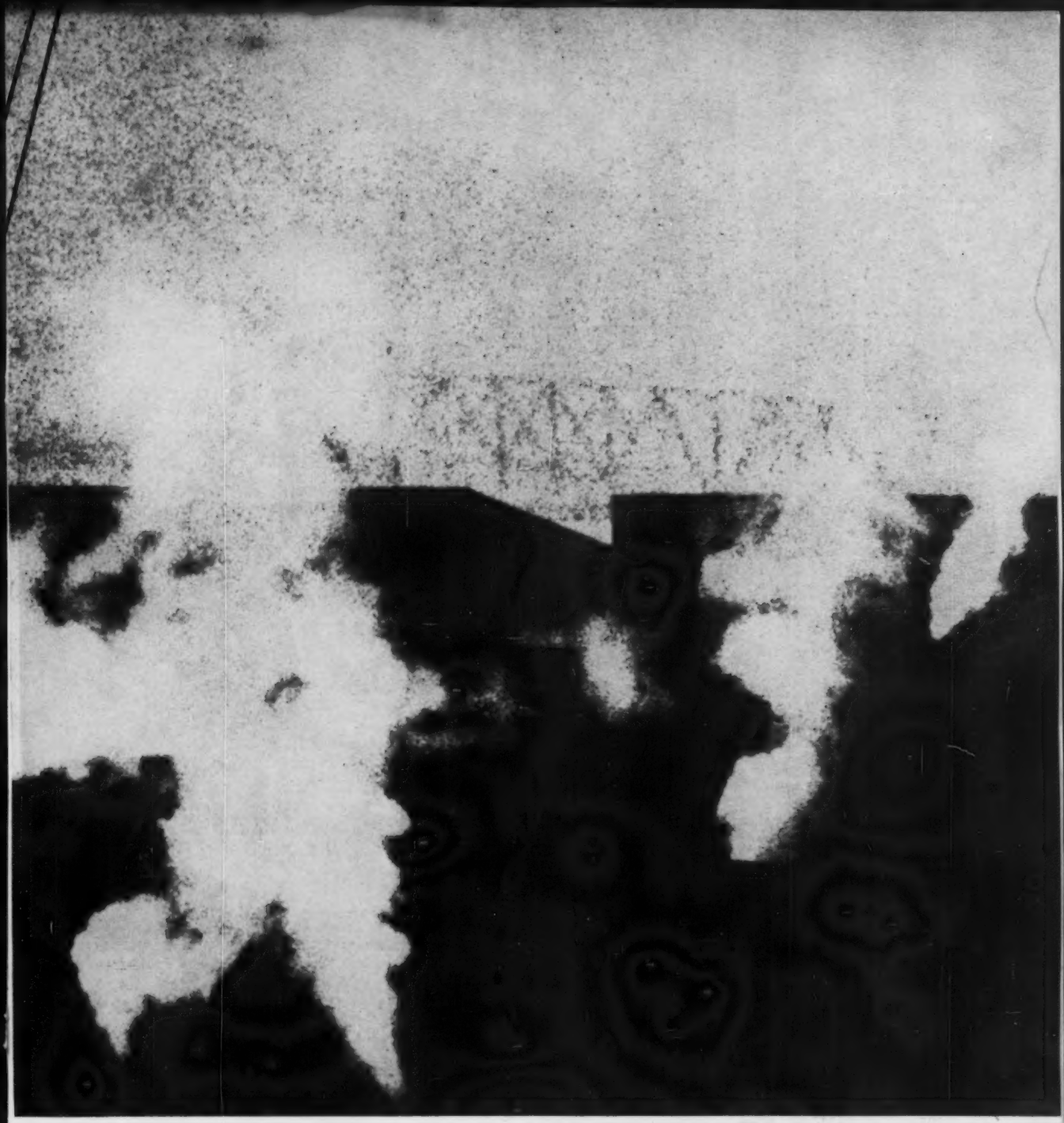
General Contractor: James S. Hickey, Portland, Oregon
Electrical Contractor: Pitman Electric Company, Portland, Oregon
Spang Distributor: Eoff Electric Company, Portland, Oregon

SPANG® CONDUIT

THE NATIONAL SUPPLY COMPANY
Two Gateway Center, Pittsburgh 22, Pennsylvania
Subsidiary of Armco Steel Corporation



Alcoa Structural Division designs and fabricates aluminum towers and substation structures that defy corrosion caused by salt spray, chemical fumes and, indeed, industrial atmospheres of all types. They never



need painting...can be relied upon to last without maintenance. Write: Aluminum Company of America, Structural Division, 892-M Alcoa Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

STRUCTURAL DIVISION

A NEW·····
G&W CUTOUT BOX

for more economical and simplified fusing and switching installations

The new G&W Type BZ box design for mounting gang-operated oil-filled cutouts offers significant advantages for both indoor and outdoor nonsubmersible installations. This general-purpose box is compact, lightweight, easily installed, and economical. It is drip-proof, splashproof, and moisture resistant — conforming to NEMA standards for such applications.

Four knockouts, one at each end and two at bottom, provide flexibility in selecting points of cable entry at the installation site. Welded seams and gaskets under cutout flanges and front cover add to weather tightness and strength. Bottom ground lugs permit side-by-side mounting, flush wall mounting, or other means of support.

G&W Type BZ Cutout Boxes are constructed of No. 10 gauge steel; light enough for easy, economical installation yet durable enough for many years of trouble-free service. The new box design is made in three sizes to accommodate G&W FC31, FC42, or FC61 cutouts rated 2.5, 5, and 8kv.

The Type BZ box is another example of the constant improvement being made by G&W in cable accessories and switchgear engineered and designed to meet the growing needs of distribution. This improvement is based upon intimate knowledge of industry requirements gained over the past 55 years. Your G&W Representative is particularly well qualified to consult with you on cable fusing and termination problems. G&W's unique engineering service is also available to assist you in meeting even the most specialized needs.

G&W ELECTRIC SPECIALTY COMPANY
3506 WEST 127th STREET • BLUE ISLAND, ILLINOIS
CANADIAN MFR. • POWERLITE DEVICES LTD. • TORONTO, MONTREAL & VANCOUVER

superior quality standards — inspired specialized design

C60-1

For phone number of closest representative see advertising index in back of book.

Now used in transformers and switch gear totaling over 25 million kw capacity

Shell Diala Oil AX has an enviable preference record in the electric power industry. This is due to its exceptional oxidation stability, plus high dielectric strength and low pour point. It all adds up to the utmost in reliability, equipment protection and long life.

Shell Diala Oil AX is inhibited to prevent oxidation . . . it has established new high standards throughout the industry. Actual tests show that Diala® Oil has two to three times greater stability than conventional oils.

Let a Shell Representative tell you about Shell Diala Oil AX. Write or call: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Ave., Toronto 2, Ontario.

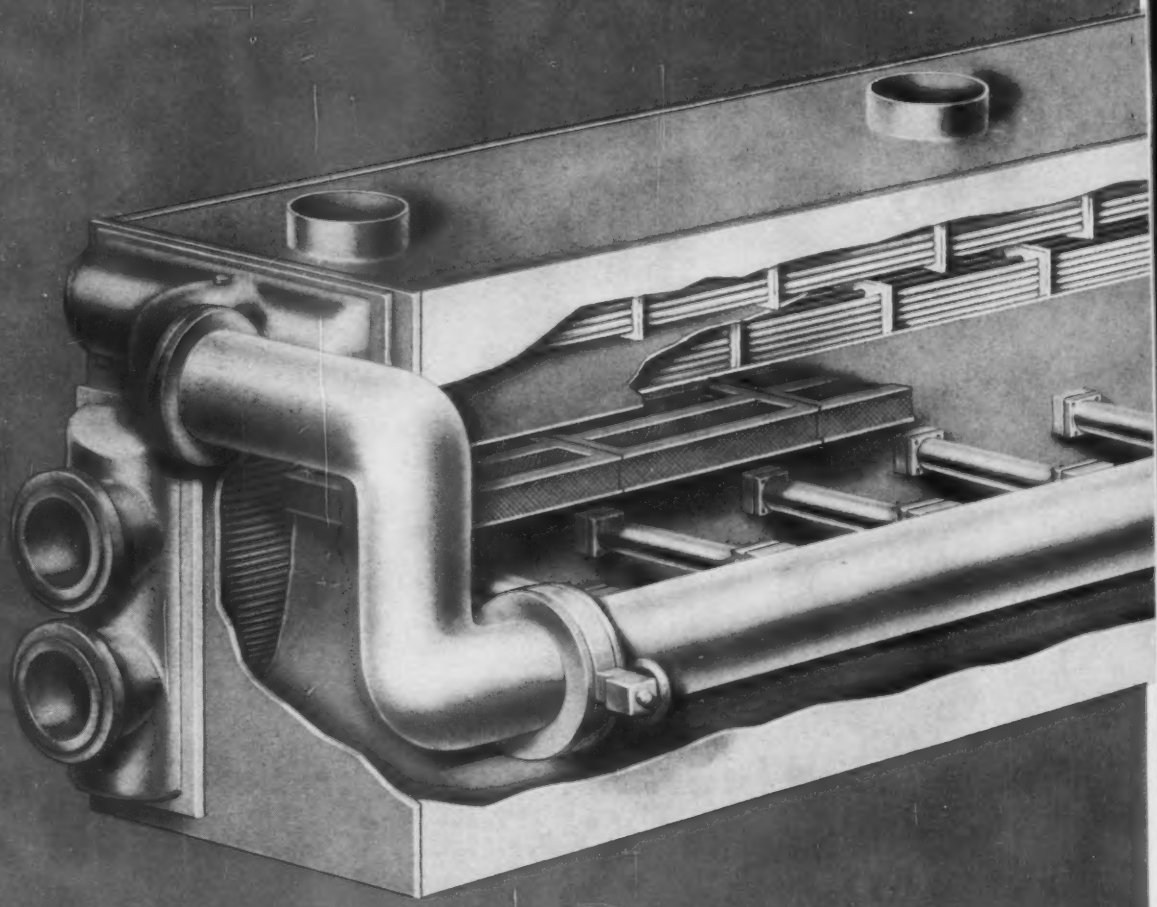
SHELL DIALA OIL AX

the inhibited insulating oil

SHELL

Westinghouse Flash Evaporator...

New Source of Boiler Make-Up

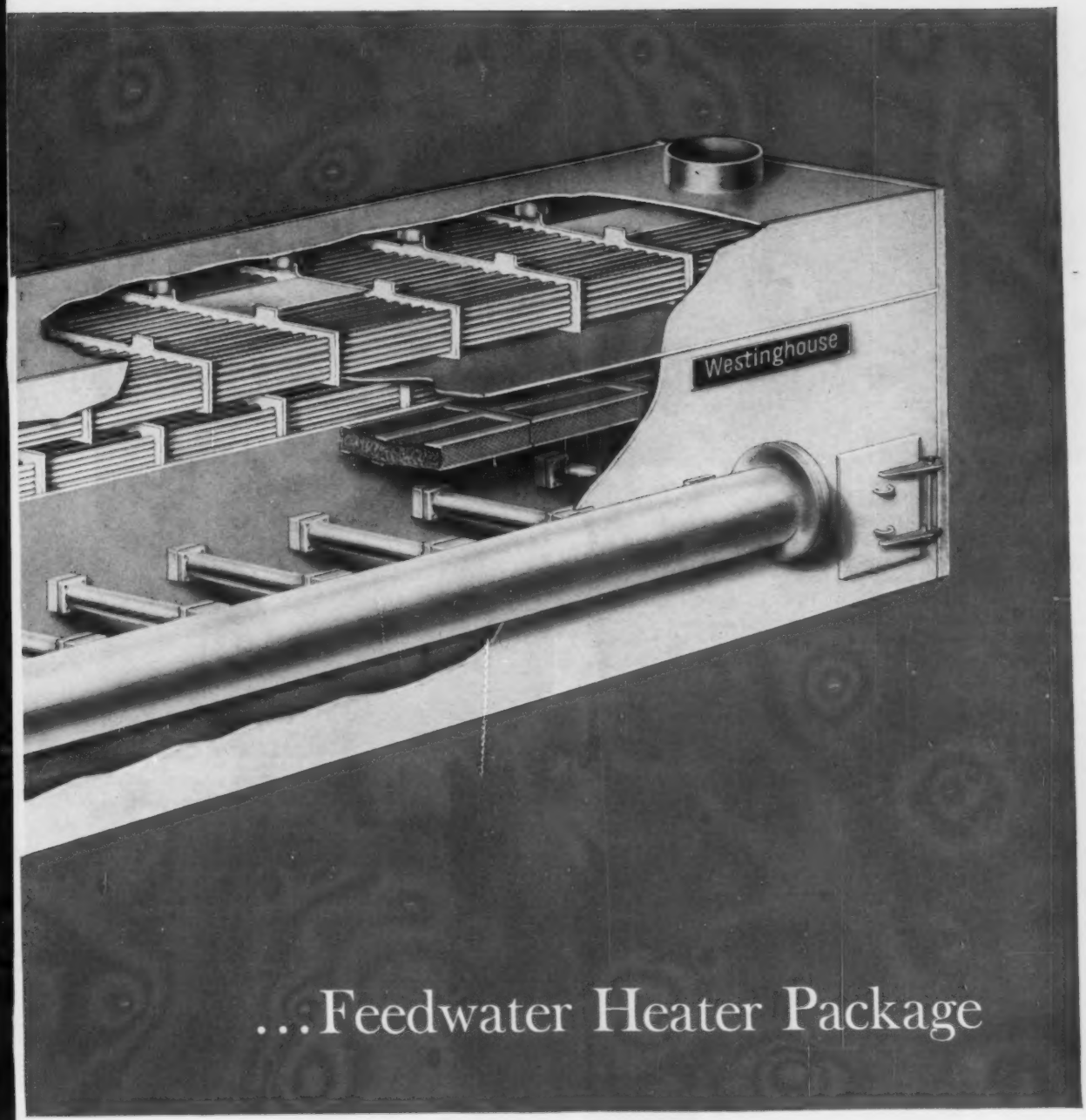


economy

No impairment to cycle efficiency/Integral piping reduces plant cost

purity

0.05 ppm from fresh water guaranteed/0.25 ppm from salt water guaranteed



...Feedwater Heater Package

adaptability

High overload capacity/Feedwater heaters integral with evaporator

You can be sure . . . if it's Westinghouse J-50619

Westinghouse

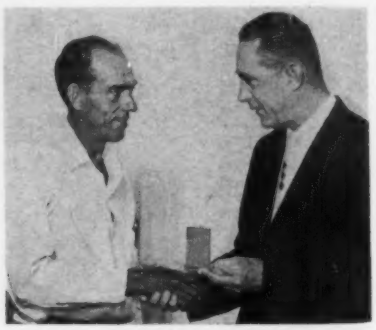
For phone number of closest representative see advertising index in back of book.

news

Site of Tacoma's Mayfield Dam, where some 400 men have been at work this fall. On the Cowlitz River between Centralia-Chehalis and Morton, the $125,300,000 development will include a second dam —Mossyrock—16 miles away. A 13-mile lake behind Mayfield Dam will begin forming about November 1961. Recent slides behind the power house site forced selection of a new location for the transformer switchyard and modification of the transformer contract. Four 50,000-kva transformers will be installed instead of the 10 15,000-kva units originally specified. Cost will be $413,200, some $80,000 less

Acting through its wholly owned subsidiary, Washington Irrigation & Development Co., Washington Water Power Co. is putting money and credit in a project to help industrialize the Spokane area. Here Kinsey Robinson, WWP board chairman, gives to W. A. Holloway, district commissioner for the U. S. General Services Administration, a $2,228,395 check in payment for the Velox Naval Supply Depot, which will become Spokane Industrial Park, with 542 acres

Feasibility of transporting electrical power up to 1,000 miles and at voltages double the highest now in use in this country has been determined by a research team from Pacific Power & Light Co. and Westinghouse Electric Corp., associated in a two-year study. Voltages up to 690 kv with lines capable of carrying more than 3,000,000 kw were studied. With the aid of digital and analog computers, the team was able to determine the effectiveness of corrective devices needed to stabilize the ultra-high voltages over the full length of circuits studied. Shown at East Pittsburgh are Marilyn Kinsey, technical aide; J. K. Dillard, manager of the Westinghouse utility engineering department, and D. E. Martin, Pacific Power & Light resource engineer



John Veriato Jr., foreman for Hawaiian Electric Co., receives life-saving award from Heco's President Ralph Johnson. Veriato gave mouth-to-mouth resuscitation to Peter Berknes, construction worker, when a guide pole he was attaching to a hydraulic jack accidently touched a 4,000-v wire

Sierra Pacific Buys Site For Thermal Plant

Sierra Pacific Power Co. has purchased a site for a steam power plant 17 miles east of Reno. The plant, to be named after Company President Frank A. Tracy, will be the first major thermal plant owned and operated by the utility.

Initial unit of the plant will produce about 66,000 kw, roughly half of the utility's present peak load. Construction is expected to be started in 1963 or 1964.

The new plant will burn coal at the rate of about 400,000 tons annually, and will connect to a present 60-kv line, which will be converted to 120 kv.

Pierce Co-op Protests

Tacoma City Light has been criticized by the Pierce County Power Cooperative for its apparent reluctance to negotiate collectively with the three communities and five mutuals who now buy power from Tacoma and distribute it to their own customers.

J. D. Ferguson, City Light superintendent, has refused to confer with Don Miles of Olympia, representing the cooperative, declared James McFarland, cooperative president.

The cooperative is considering purchasing power directly from the Bonneville Power Administration rather than from Tacoma.

"I am convinced every one of our members will find it financially feasible, as well as sensible from an engineering point of view, to sign with Bonneville," McFarland said.

Purchase of power from Bonneville would represent savings ranging from $7,000 to $8,100 annually for the eight members of the cooperative, according to McFarland. Savings in wholesale costs would exceed 25% although part of these savings would be offset by new expenses that would be incurred.

► Examiner Edward B. Marsh of the FPC held that **Montana Power Co. should increase its payments** to Flathead Reservation's Indians by $50,000 annually. Examiner Marsh said that the U. S. Interior Department had failed to offer any evidence to support its contention that these payments should be increased to $63,375 per year. The payments would compensate the Indians for use of their land for an additional generating unit at the company's Kerr hydro project in Montana.

Columbia Debris

Members of the Columbia Basin Interagency Committee, meeting at Wenatchee, Wash., suggested that debris on the Columbia River may be a problem for the International Joint Commission to help solve.

Several officials pointed out that the debris on the river, largely attributed to logging and milling operations in Canada, has become a serious hazard to boating on the river and has complicated and increased the cost of operating each dam on the Columbia.

Bureau of Reclamation officials pointed out that the volume of debris on Lake Roosevelt (Grand Coulee Dam reservoir) is now three times greater than it was 10 years ago.

► **The California Public Utilities Commission** authorized higher rates for 20,200 customers of California-Oregon Power Co. in five northern California counties—Del Norte, Modoc, Shasta, Siskiyou and Trinity. Copco requested a $267,000 per year increase, and suggested it be assessed entirely from residential customers, but the PUC said it would spread the increase more equitably, with approximately $62,000 per year from commercial and industrial customers, and $205,000 per year from residential customers.

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Agreement Signed on Pipe-Line Project

The $225 million pipe-line project designed to bring huge new supplies of natural gas into southern California from Texas and Mexico moved an important step nearer realization with signing of a 20-year agreement between Southern California Edison Co. and Humble Oil and Refining Co., calling for delivery of a major portion of the fuel.

Under terms of the agreement, Humble would sell to Edison a total of approximately 1.8 trillion cu ft of gas from various fields in south Texas.

Deliveries would start with about 108 million cu ft a day during the first year, and rise to a maximum of 265 million per day beginning with the fifth year.

The Texas supplies are in addition to gas to be obtained from Mexico by Edison, it was explained by Edison.

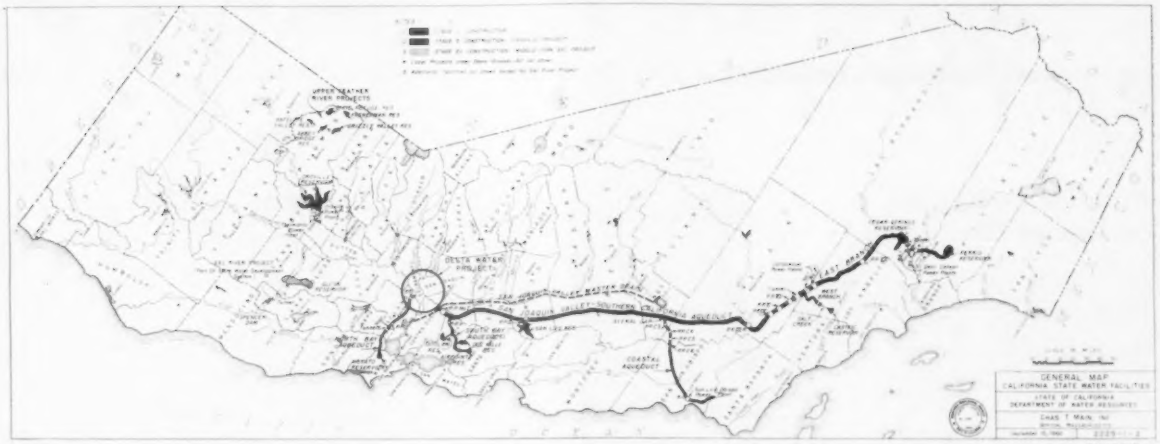
Edison would use the Mexican and Texas gas as an energy source for generating electricity; however, the Mexican gas could be made available if needed to meet demands of residential customers in the Los Angeles basin during peak periods.

► **Bonneville Power Administration** revenue of $68,764,000 for fiscal year 1960 was a 3% increase over revenue of $66,747,000 for fiscal 1959.

BPA's fiscal 1960 energy sales totaled 29,682,900,000 kwh compared to 28,664,300,000 in fiscal 1959, a 3.6% gain.

BPA's sales to private utilities dropped 19.5% from fiscal 1959 while sales to publicly owned utilities increased 12.8%. Direct sales to industry were up 8.8%.

► **Lincoln Service Corp.** has applied to the Wyoming PSC for authority to decrease its rates for standard users of electricity in residential areas of Kemmerer. V. A. Bair, general manager of Lincoln Service, said the new rate schedule will mean a decrease of approximately 25% in rates for over 800 kwh per month. For the first 800 kwh used, there will be a very slight decrease, Bair said.



California state water plan facilities are shown on this map. An appropriation for this work was carried by a slim 140,000 margin in the November election. The $1.75 billion project is the largest bond issue ever submitted to California voters

Rules on Tax Exemption

The Washington State Legislature has the authority to exempt private electrical utilities from property taxation if its purpose is ultimate equalization of the tax structure.

Attorney General John J. O'Connell has so informed Donald C. Sampson, executive secretary of the Legislative Council, which was directed by the 1959 legislature to study utility taxes and make recommendations for future legislation.

The exemption would not be discriminatory if a privilege tax were levied on the utilities at the same time the exemption is granted, O'Connell said. Requirements of the legislation would be equal taxing for all electrical utilities, public and private, and equitable distribution of tax funds to all taxing districts, based on the location and operation of the various utilities, the council was told.

Observers agree that the exemption is unlikely from a political point of view, even if constitutional.

Rate Reduction

Rate reductions have been announced by three public utilities in western Washington.

A new schedule instituted Oct. 1 by the Mason County PUD No. 3 reduced rates approximately $40,000 a year, according to Manager Claude Danielson.

Customers of the Pacific County PUD will save $18,000 a year, under a new schedule effective Nov. 1. The end residential rate is reduced from 1.1¢ to 1¢ per kwh. for the 571 customers using more than 2,000 kwh a month.

The town of Milton will change its end residential rate to 1¢ for everything over 1,400 kwh, effective Nov. 28. However, the rate for the third bracket, covering the next 800 kwh after the first 600, will increase from ½¢ to ¾¢.

Giant Power!

An eight-point program to create a "Giant Power" grid in the Pacific Northwest was outlined by Gus Norwood, executive secretary of the Northwest Public Power Assn., at a meeting of the Downtown Kiwanis Club in Tacoma.

At a meeting of the Rural Electric Cooperative Assn., Norwood recommended a 460,000-v intertie between the Columbia and Missouri River basins.

"Such high-voltage transmission lines will not only assure an abundance of low cost power to our rural electrical systems in Montana, but can also create new job opportunities for Montana youngsters in new industries, such as the new steel plant which is being established at Anaconda," Norwood said.

► **Seattle City Light** will aid the University of Washington in a fishery research program, under a proposal submitted to the City Council by Paul J. Raver, City Light superintendent. Council approval is expected. Raver told the council that City Light faces serious problems dealing with salmon movements at its proposed Copper Creek Dam on the Skagit River, downstream from the utility's dams at Gorge, Diablo and Ross. The Copper Creek site has been under study for a number of years.

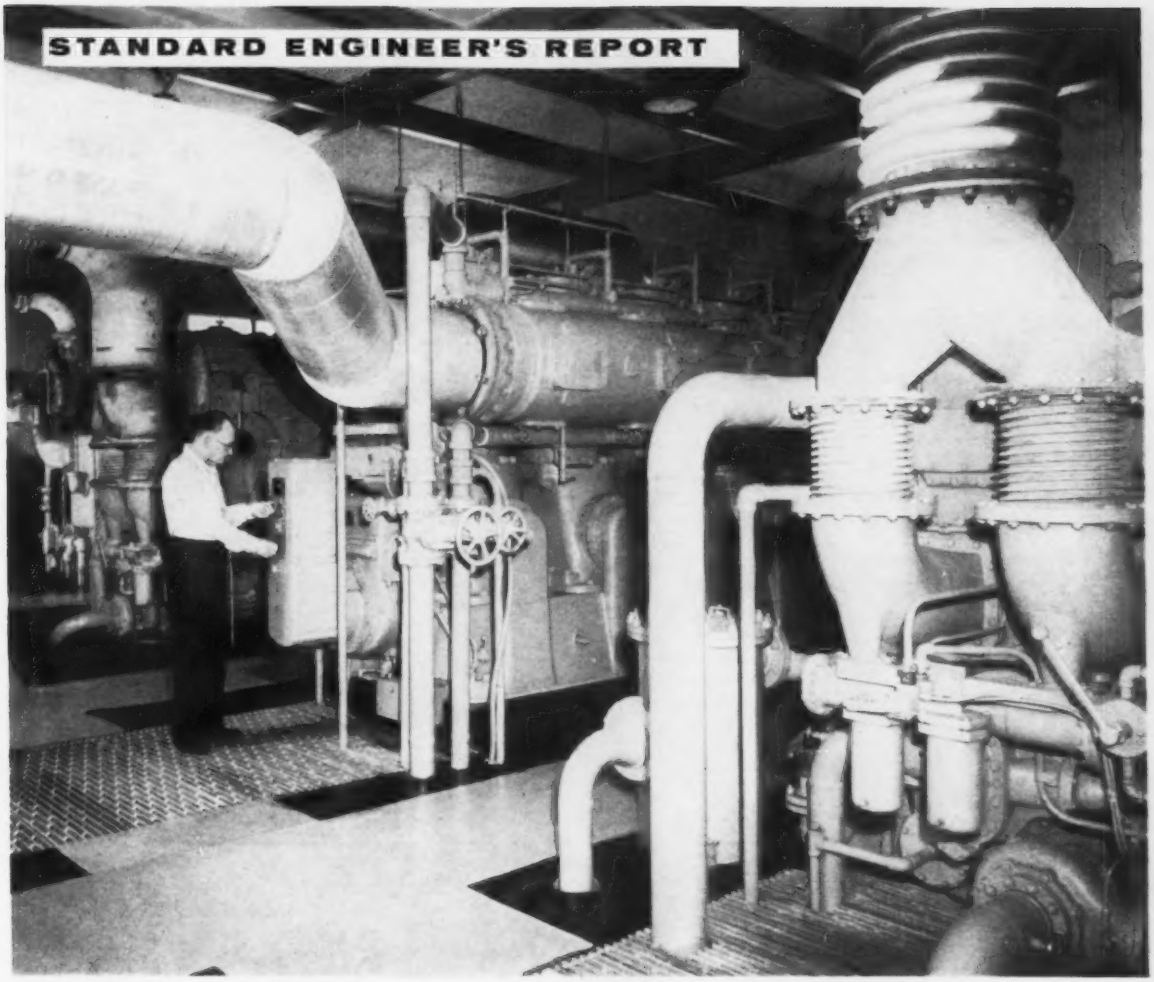
Financial Notes

A relative stagnation in the bond market was pointed up when $60 million in Pacific Gas and Electric bonds received a weak reception in San Francisco. By the first week of November less than 45% of the bonds had been purchased by the public.

Bonds were bought by a syndicate headed jointly by Halsey, Stuart & Co. and First Boston Corp. Underwriters' price was 99.32% at interest of 4⅝%. Second highest bid for the issue was by Blythe & Co., at 99.26%, same interest. Bonds are sold to the public at par.

The situation might indicate unusually rough sledding for utility bond issues in the months to come. With the 4⅝% interest rate, PG and E had to guarantee the bonds against refunding by the sale of securities bearing lower interest rates for a period of five years. Bonds are due June 1, 1992.

► The FPC has authorized **Pacific Power & Light** Co. to issue up to 27,736 shares of common stock, par value $6.50 per share. Pacific Power & Light will sell the stock to its employees under an employees' stock purchase plan. The offering price per share will be 95% of the average of the weekly bid prices publicly quoted for such stock for the cal-



Maintenance costs cut 60% using RPM DELO Oil

The Municipal Power Plant, West Bend, Iowa operates four diesel engines generating over 4 million hours of electric power a year. Since 1945, RPM DELO Oils have done an outstanding lubrication job . . . extended overhaul periods, and reduced maintenance costs by 60%.

Plant Superintendent N. P. Cuplin reports: "At the last major overhaul of our 1400 hp. Fairbanks Morse diesel, average wear on ten cylinder liners was only .007 after 4½ years of continuous operation. This is one third of normal wear. Interior parts were clean and unclogged.

"We tried a number of other products before we settled on RPM DELO Lubricating Oil. We've not only cut maintenance expense but have reduced fuel costs too, because RPM DELO's higher cleaning ability has allowed us to use a lower gravity diesel fuel oil."

RPM DELO OIL reduces wear and prolongs engine life because it clings to parts whether engine is running or idle. An anti-oxidant fights gum and lacquer formation, special detergent keeps parts clean. Other additives prevent bearing corrosion, crankcase foaming.

Why not try RPM DELO Oil? Let it cut costs, lengthen equipment life. Contact your local representative or write 225 Bush St., San Francisco 20, California.

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endar month preceding the month in which subscription applications are accepted.

► **California Electric Power Co.** and **Sierra Pacific Power Co.** have filed applications with the FPC seeking authority to issue unsecured promissory notes up to a combined amount of $21 million. The Calectric loan is for $15 million and the Sierra Pacific loan for $6,000,000.

Arizona Public Service lineman Clyde Bowden, left, and Jim Ripley use a wire-cleaning device suggested by crew foreman Joe Andrews. Hotstick grips emery cloth, which is pulled back and forth to give a polish

Wire Cleaner Saves

A wire cleaner that is making sense and saving dollars has been devised by Arizona Public Service crew foreman Joe Andrews at Phoenix.

Servicemen had been using steel brushes to remove dirt and corrosion from conductors before making taps until Andrews fabricated a device to do the job easier and cheaper.

He uses a 10-in. strip of emery cloth with metal eyes at each end, which are gripped by hotsticks. Pulling the cloth back and forth across the wire gives it a clean polish.

The idea works fine on wire—works better for cleaning bus bars in substations and switch yards. Although the emery cloth lasts only half as long as the steel brushes, it costs only one-seventh as much.

Quick Tower Work on Portland General Electric System

With an aerial assist, Portland General Electric Co. recently installed a 60-ft-high aluminum tower in 55 minutes. The helicopter took 21 minutes to lift the tower into position and the remaining 34 minutes were required for the line crew to bolt and guy the experimental structure. The dead-end tower with a tubular aluminum crossarm was designed and fabricated to serve as a conductor terminal structure isolating or separating one portion of the line from another. With guy lines, the tower is completely self-supporting. Three 62-ft-high aluminum poles, each containing three of the W extrusion sections, are set in a line and connected by a cross bar to form the tower. PGE used the new aluminum tower to replace a wooden dead-end structure terminating its Harborton to St. Helens line

Growth

New BPA Contracts

Bonneville Power Administration and the **United Pacific Aluminum Corp.**, Los Angeles, have signed a 20-year power contract for establishment of a new aluminum reduction and processing plant near Longview, Wash.

The contract calls for 45,000 kw of firm and 45,000 kw of secondary industrial power for operation of two potlines with an annual production capacity of some 45,000 tons of pig aluminum. Initial deliveries to the new aluminum plant are scheduled for Jan. 31, 1962. Full contract requirements are called for not later than Dec. 31, 1963.

Bonneville facilities to serve the new industry will include a 125,000-kva substation near Barlow Point, a 230,000-v tap on the Chehalis-Longview transmission line, and a 230,000-v line from Barlow Point to the Longview substation. Substation and transmission facilities will be scheduled to coincide with completion of plant facilities.

BPA and Webb & Knapp Inc., New York, have signed a 20-year contract for electric power to supply a new type steel mill planned at Anaconda, Mont.

The contract calls for delivery of 120,000 kw of power. Half of the supply will be delivered starting July 1, 1963, and the remainder by Nov. 1, 1963. About 45,000 kw are firm and 75,000 are secondary industrial type.

Power for the operation will be supplied from a new substation to be built by Bonneville at Anaconda and will require a second 230,000-v transmission line between the Nixon switching station and the Hot Springs substation.

Turbines for B.C. Electric

First of six turbine generators has been shipped to Vancouver, B. C., by Associated Electrical Industries, Manchester, for B. C. Electric. One 155-ton section will have to be unloaded at the U. S. Navy's drydock at Bremerton, Wash., as there is not a crane large enough to handle the job in Vancouver. The section will then travel by barge to the site of the new thermal power plant of B. C. Electric on Burrard Inlet.

Allis-Chalmers Low Bidder

Allis-Chalmers Mfg. Co. appeared to be low of 10 bidders with $70,500 when the Portland U. S. Army Engineer District opened bids for the design, manufacture, test and delivery by April 1, 1962, of one 30,000-kva power transformer and appurtenances for Cougar Reservoir on the South Fork McKenzie River, about 42 miles east of Eugene. Six of the 10 bidders were foreign.

Gorge Dam Increases

Placement of 272,000 cu yd of concrete in the High Gorge Dam of Seattle City Light on the Skagit River has been completed, with the exception of some finish work and installation of spillway training walls. The spillway section is being readied for two spillway gates, each 50½ ft high and 47 ft wide, which are being partially assembled in the work area and will be completed when they are set in position in the spillway slots.

With water level about five feet below the spillway, the Gorge power house is generating 134,000 kw. This is an increase of 26,000 kw over the 108,000-kw original capacity. By January, with spillway gates closed and the water up to elevation 875, capacity of the power house is expected to be about 160,000 kw. Next summer, when the last of the four Gorge generators is modernized and equipped with a new water wheel, capability of the plant will be 165,000 kw.

REA Loans Authorized

Colorado: La Plata Electric Assn., Durango, $404,000, to finance construction of headquarters facilities and a branch headquarters at Pagosa Springs, and 15 miles of distribution line.

New Mexico: Mora-San Miguel Electric Cooperative, Mora, $344,000, to finance construction of 65 miles of distribution line, and system improvements including 62 miles of tie line, and a new 2,500-kva substation at Storrie Lake.

Washington: Ferry County PUD, Republic, $215,000, to finance construction of 44 miles of distribution line, and to make system improvements including one mile of tie line and conversion of four miles of existing line.

Wyoming: Tri-County Electric Assn., Sundance, $807,000, to finance construction of 156 miles of distribution line, four substations and 10 miles of tie line. Plus one mile of 35.5-kv transmission line and five miles of 65-kv transmission line.

SMUD's Growth Forecast

Sacramento Municipal Utility District officials predict the district's 1960 peak load of 342,000 kw will grow to 550,000 kw by 1963 and 860,000 kw by 1967.

Paul E. Shaad, chief engineer and general manager, reports the district will be generating 229,000 kw of its own power from the Upper American River project, now under construction, by 1963.

SMUD has a contract for 290,000 kw of power from the Bureau of Reclamation's Central Valley project and a contract to buy from the Pacific Gas and Electric Co. supplemental power to meet its needs. The district drew heavily on the PG and E source during the 1960 summer.

SMUD's first power from the Upper American River project will be generated shortly after the first of 1961.

Eventually, according to Shaad, SMUD will probably be producing 525,000 kw from nine plants on the American River.

Seek FPC Permit

Plains Electric Generation and Transmission Cooperative Inc. of Albuquerque has filed an application with the FPC seeking a preliminary permit for a proposed hydroelectric project on the Rio Grande and Red Rivers near Questa, N. M.

Under the preliminary plan of development, water would be pumped 350 ft to the top of the bluff at the Chiflo dam site on the Rio Grande and then transported by canal 6.5 miles downstream to a reservoir at a point above the power house site at the confluence of the Rio Grande and Red Rivers. Water would also be pumped from the Red River at a point about four miles upstream from the power plant, to the top of the bluff and then transported by canal to the upper reservoir.

► **Arizona Public Service Co.** is distributing a colorful bulletin entitled "Introduction to Arizona," which points out that Arizona's population is now 1.3 million, and gaining at the rate of 5,000 new residents a month. They further state that Arizona now rates as second in growth of agricultural income, in rate of income and bank deposit growth.

Communications

► Southern California Edison's **power plants wired for sound** continue to meet with the approval of the remotely located operators, says L. E. Ludekens of the company. Both the Portal and Mammoth Pool plants have microphones placed at strategic locations and the composite sound from each individual plant is transmitted over carrier and microwave voice circuits to the operator. Operators have become familiar with the the plant noises and quickly detect any abnormality. So far they have heard the chatter of a loose brake and the hiss of a broken pipe and were able to instigate emergency maintenance in time to minimize damage. Since a voice channel is usually supplied to most installations of any size, this is an excellent means of adding to the effectiveness of remote control.

► Idaho Power's **salmon wired for sound** are leading the fish biologists a merry chase through the backwaters of Brownlee Dam. In an effort to chart the paths taken by salmon migrating upstream to spawn, a number of salmon have been equipped with small ultrasonic beacon transmitters operating at a frequency of 132 kc. The tiny unit uses a transistor oscillator and crystal to impart the sound to the water. Including a 60-hour battery, the plastic encased unit is about 1 in. in diameter and 2 in. long. It is attached to the fish's back and can be detected from a distance of as much as 1,500 ft under good conditions. The tracking boat is fitted with an underwater sound pickup with suitably spaced heads, which makes it possible to determine both azimuth and vertical angle to the beacon. Slope distance to the beacon is supplied by sonar which is oriented from the sound pickup, thus providing information from which depth can also be calculated.

► **AT&T,** no doubt using exotic mathematics employing the pecuniary factor, has asked the FCC for space in the 6,500-mc microwave region for a proposed satellite relay project. The initial proposal merely straddles the private microwave assignments, with the assurance that no harmful interference will result

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—largely because they will require the whole spectrum between 6,425-6,925 mc at some later unspecified date for completion of the project. Private microwave systems, particularly those of right-of-way companies, have found this frequency band best adapted to their needs, and consequently would suffer greatly from its loss. Perhaps the selection of frequencies has no strategic significance but, regardless of this, the over-all result woud be either to require a move to an entirely different microwave band or lease circuits from the common carriers. Both of these alternates are more expensive than the prevailing arrangement. It is possible that simultaneous operation of the satellite relay and operational fixed stations can be achieved as has been suggested; however, until this is proved private microwave users must not let the FCC forget the extent to which this facility has become an integral part of their operations.

► **NEAR** (national emergency alarm repeater) has been given a test by OCDM in Charlotte, Mich. Electric utility engineers will recognize it as an adaptation of electric water heater controllers that have been in use for many years, with varying degrees of success. The receivers are small boxes containing resonant relay, delay timer and vibrating reed. They are designed to be plugged into any convenience outlet without special wiring. Operating frequency for the test was 240 cps. While it is not difficult to couple the alarm generator into the substation feeders, it is a monumental headache to get the signal through capacitor banks and what not on lengthy feeders, or feeders having a large number of stubs. And worst of all, guess whose fault it will be if they work when they shouldn't or fail to when they should.

► T. W. MacLean of Washington Water Power reports that a **Civil Defense Emergency Radio Network** has been successfully tested by electric utilities of Spokane, Portland and Seattle. Using a test frequency at 48.34 mc they were able to link Spokane to Seattle by means of relay stations on Mt. Spokane and Birch Mountain, and Spokane to Portland via Mt. Spokane and Jump Off Joe Mountain. Since the network will use frequencies for which equipment is readily available, it should be possible to keep it in operation even in the face of continued station damage or sabotage.

Washington Report

Columbia River Agreement With Canada

The United States and Canada are on the threshold of formal agreement toward joint development of the Columbia River in both countries—involving nearly 9,000,000 kw of added energy, 1,700,000 kw of prime power, nearly $1 billion in construction in the U. S. during the next decade.

Basically, the agreement covers principles by which the U. S. would pay for increased water and power benefits received at its downstream sites as the result of dam construction on upstream areas in Canada.

Canada, under the proposed agreement, plans to build dams at High Arrow ($71,800,000), Duncan ($25,600,000) and Mica Creek ($247,200,000), while the U. S. would build long-discussed Libby Dam ($322,900,000) on the tributary Kootenay River in Montana—backing up into Canada. And in addition, the U. S. would spend $293 million on added generating units at existing downstream Columbia River plants, $140 million for transmission lines; while Canada would spend about $50 million for transmission.

The U. S. will get 645,000 kw of prime power from Canada's High Arrow Dam (Canada gets 484,000 kw), U. S. will get 138,000 kw from Duncan Lakes (75,000 kw), 359,000 kw from Mica Creek (204,000 kw), and all 544,000 kw from Libby.

The agreement still has to be reduced to final, specific language to be submitted as a treaty for signing and ratification by both nations. However, "the first olive is out of the bottle," and the rest should come easily. The proposed agreement took about nine months, following a 1959 Christmas Eve recommendation by the international joint commission on "basic principles" to be used in determining specific projects, cost and power figures.

The proposed agreement was the work of a three-man U. S. delegation (Interior Under-Secretary Elmer Bennett, chief engineer, Lt. Gen. Emerson Itschner, State Department Official Ivan B. White) and three Canadian representatives.

The treaty draft should be ready for submission to the two governments by the end of this year.

Under terms of the proposed treaty, the U. S. has a five-year option to build Libby Dam, not to exceed pool elevation 2,459. This probably will be a federal dam.

The agreement is expected to lead to sizable increases in installed capacities at a number of existing downstream hydro-power projects. For example, Grand Coulee Dam will be expanded from its present 1,944,000 kw to 3,672,000 kw, and this will require a new power plant downstream from the dam alongside the river. About a half-million kw of installed capacity, some of it attributed to the Canadian agreement, will be added each at Wanapum, Rocky Reach, Priest Rapids, Chief Joseph, McNary and The Dalles Dams. And John Day's installed capacity will rise from its initial capacity of 1,119,000 kw to an eventual 3,105,000 kw.

Nez Perce-High Mountain Sheep Hearings

Heated words and side issues marked the opening of the Federal Power Commission's hearings on rival Nez Perce and High Mountain Sheep hydro-power applications in Washington, D. C.

Evelyn Cooper, attorney for Nez Perce applicant, Washington Public Power Supply System, filed a series of motions to delay proceedings, to subpoena FPC staff members on charges of bias and to subpoena files of rival applicant, Pacific Northwest Power Co., on charges it violated antitrust laws.

But the FPC presiding examiner, William C. Levy, turned her down on the first two motions. Mrs. Cooper appealed these two and added the third with the full commission. Over her objections, Levy convened the proceedings (on cross examination) Nov. 4, and hearings commenced immediately.

Mrs. Cooper's motion, in detail, had been the following:

1. Charges of "clear bias" and "preconceived conclusions" in favor of the PNP High Mountain Sheep project were filed against Francis L. Adams, chief of the FPC's bureau of power, and Lesher S. Wing, regional engineer for the commission's San Francisco office. The WPPSS motion called for subpoenas of both Adams and Wing, plus their office records to determine whether they influenced FPC staff testimony in favor of High Mountain Sheep. FPC Staff Attorney Donald Sander, however, called the Nez Perce charges "an unwarranted and malicious attack on public servants, wholly without justification or foundation," and added that the charges "stem from illogical reasoning" and are "evasive, inconsistent and confusing."

2. A petition to postpone the start of the hearings until January. Nez Perce attorneys claimed they wouldn't have time to prepare their cases for the start of the Nov. 4 hearings since Examiner Levy didn't rule on motions to strike testimony until that date.

3. A motion to subpoena documents from Pacific Northwest Power Co. on grounds that the company violated FPC antitrust provisions, as well as those of the Securities & Exchange Commission. This motion was filed directly with the full commission, although Levy earlier had cautioned Mrs. Cooper that her references to the SEC were outside the scope and jurisdiction of the FPC. The FPC antitrust provisions she pointed to were Sections 10 (h) and 305 (b) of the federal power act. These prevent combinations to restrain trade, and interlocking directorates.

The FPC staff, whose testimony indicated that High Mountain Sheep was the more desirable of the two projects, won't make any definite recommendation until the hearing has been concluded. FPC Staff Attorney Sander said he could make one of three recommendations: (1) for Nez Perce; (2) for High Mountain Sheep; (3) for neither.

Two outside factors also may play heavily on the outcome of the case—a possible bill in Congress to authorize a federal hydro-power dam at the High Mountain Sheep (not Nez Perce) site; and moves to delay FPC approval of either High Mountain Sheep or Nez Perce because of the proposed U. S.-Canada agreement to develop up to 1,700,000 kw of additional prime power on existing main stem Columbia dams.

The possible federal dam at High Mountain Sheep would be a two-edged sword: it would follow engineering data that show this site to be better (together with Lower Canyon Dam) than Nez Perce; and it would give the public bodies backing Nez Perce preference rights.

The Columbia agreement already has produced comments by President Eisenhower and Interior Under-Secretary Elmer Bennett that there's no need to rush into approval of either of the rival projects before the FPC—and Interior Secretary Fred Seaton probably is follow-

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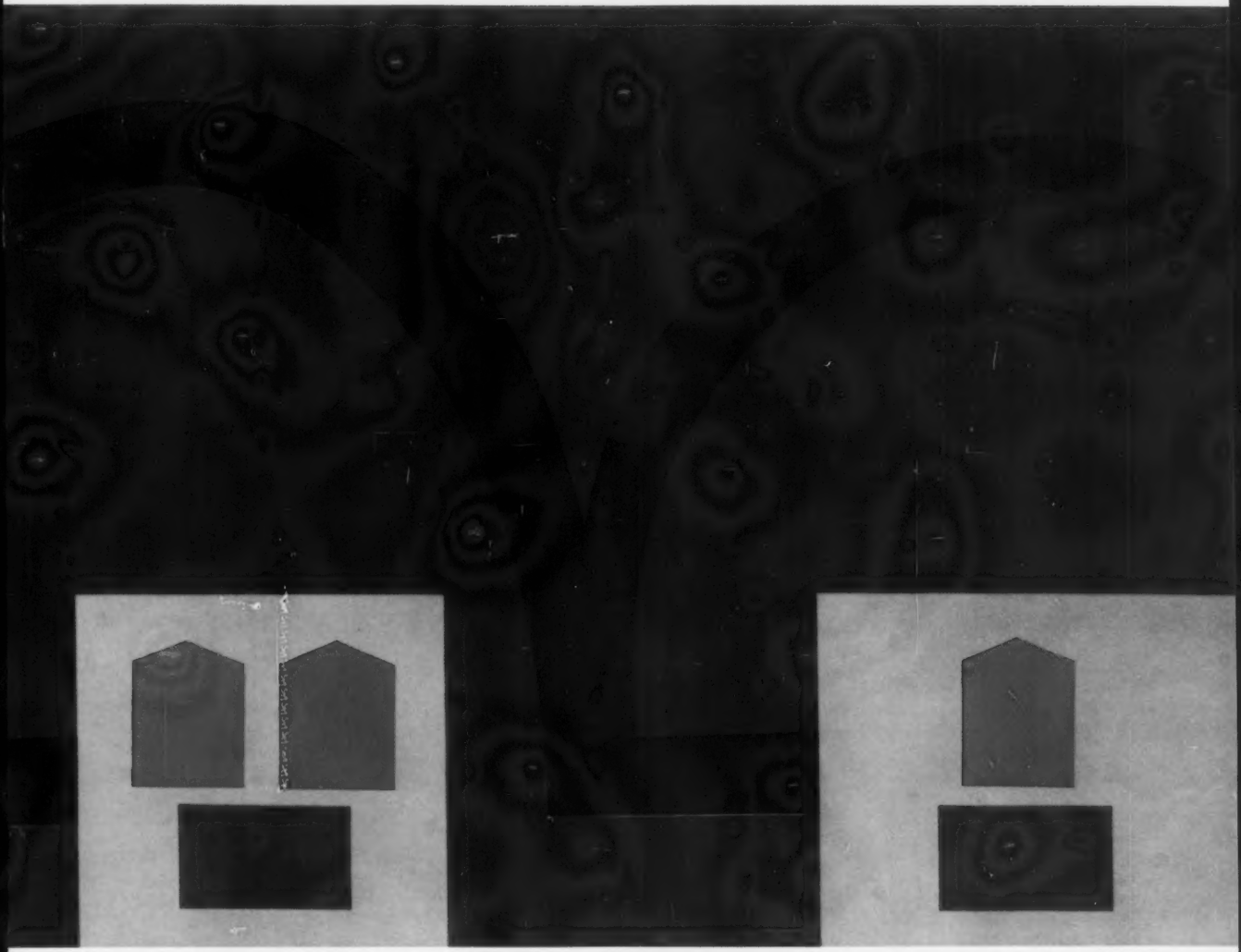

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ing this up with a similar letter to FPC Chairman Jerome Kuykendall —because the added prime Columbia River power will fill all or most of the anticipated power gap during the next several years.

Both Nez Perce and High Mountain Sheep rivals refuted this argument, claiming their project would be needed regardless. Mrs. Cooper argued that the Columbia power would remove the need to rush immediately into High Mountain Sheep but that, in the long run, Nez Perce would be needed by the time it was built. PNP Attorney Hugh Smith argued the opposite: that Columbia power would remove the need for the large, single inflexible block of power planned at Nez Perce, but the smaller High Mountain Sheep project would dovetail with Columbia power, while PNP's proposed future dam at Lower Canyon could be built when needed.

Smith blasted WPPSS in his opening remarks, as the hearings began, questioning whether the Washington public system "has the stomach" to try the case on its merits. He charged that WPPSS would turn the FPC hearing into a political issue because it couldn't hope to compete with the High Mountain Sheep plan. "If they (WPPSS) were acting in good faith," asked Smith, "why didn't WPPSS file for Lower Canyon Dam?" This, he said, wouldn't conflict with High Mountain Sheep, is a good project, and could be built as soon as Nez Perce could – when the fish problem is solved.

If WPPSS is licensed to build Nez Perce, said Smith, "it will be a monster" ignoring law on grounds it is not subject to usual utility regulation. He cited the fact that WPPSS hadn't filed for permission from Oregon to build part of its project within that state.

Mrs. Cooper blasted back at Smith's "unlawyerlike" remarks, and she referred to PNP's proposed future Lower Canyon Dam as a "paper dam" because it never will be built.

Mrs. Cooper described how WPPSS had tried to block the PNP license application earlier with legislation in Congress – the "moratorium" bill. But when this failed, she said, the public body put on a "herculean effort" to draft a license application for Nez Perce at the last minute to compete with the High Mountain Sheep plan. She insisted Nez Perce has three times the power potential of High Mountain Sheep (without Lower Canyon Dam) and said she would take "every step necessary" to see that Nez Perce, not High Mountain Sheep, is built.

Nuclear News

Dresden Dedication

Commonwealth Edison Co. on Oct. 12 dedicated the world's largest nuclear power plant. Approximately 2,000 invited guests attended the ceremonies celebrating the completion of the nation's first full-scale privately financed 180,000-kw nuclear power station.

The $51 million Dresden plant was built with the cooperation of Nuclear Power Group and has already produced about 180 million kwh of electricity for Commonwealth Edison customers.

General Electric's dual-cycle boiling water reactor is the power source for Dresden station. The reactor contains about 65 tons of nuclear fuel. This initial load is expected to last 3½ years and will produce as much electricity as two million tons of coal.

Advanced Test Reactor

The Atomic Energy Commission has selected as a basis for contract negotiation a proposal of Ebasco Services Inc. for performance of complete architect-engineering services in connection with an advanced test reactor planned for the National Reactor Testing Station.

The proposed reactor project, costing $24 million, will be capable of operating at a power level of approximately 250,000 kw of heat making it the largest nuclear test facility in the United States when completed in 1964.

Ground Broken

Ground has been broken at Parr, S. C., for the Southeast's first nuclear power project, a 17,000-kw generating station, being built by a utility group made up of Duke Power Co., South Carolina Electric & Gas Co., Carolina Power & Light Co. and Virginia Electric & Power Co.

Westinghouse is responsible for development and design of the reactor plant and is furnishing equipment for it. Stone & Webster is architect-engineer for the plant. This project will cost about $43 million, of which the AEC will supply $15 million.

This reactor for the Parr plant will use heavy water both as a coolant and moderator. The moderator slows down "fast" neutrons so that they can carry on a self-sustaining fission process. Until now, most commercial water reactors have used ordinary water as the moderator and enriched uranium as fuel. A large heavy-water reactor may not need enriched uranium, thereby reducing the cost of fuel processing.

This new reactor type will also eliminate the large pressure vessel and its physical limitation on reactor size. Instead of the heavy steel vessel that houses the entire core and its structural support, this reactor will have 42 U-shaped pressure tubes.

Antarctic Nuclear Plant

About one year from now, the first nuclear power plant to be used in the Antarctic should be ready for shipment to McMurdo Sound.

The Martin Co. is prefabricating this portable medium power range plant (PM-3A) for the Atomic Energy Commission. This pressurized water reactor system is designed so that it can be put together within 60 days after arrival at the site and readied for full power generation only 15 days later.

Martin is also prime contractor for the PM-1 nuclear power plant, a 1,000-kw system to installed at Sundance Air Force station, Wyo., in 1961.

This plant is described as "the first power reactor that will be making a profit." Because of high transportation costs, diesel oil in a remote area like the Antarctic is more expensive than the nuclear fuel required to produce the same amount of electricity. It would take millions of gallons of fuel oil to equal the energy output of the PM-3A core.

The increased electrical supply, 1,500 kw, at McMurdo will make possible a far better communications system than now exists. Oil stoves in the galleys will give way to electrical ones; and, if a projected second reactor is added during the following season, all buildings will be heated electrically.

Nuclear power for the Antarctic is taking shape and the men at McMurdo will be glad to see it come.

► **General Electric** employees at Hanford passed their ten-millionth man-hour without a single disabling injury; a new all-time safety record.

Market Development

Continental breakfasts each morning gave conference delegates a chance to visit and to look over the laundry equipment displays set up by manufacturers and manned by experts

Laundry Conference Returns to San Francisco

Bringing its national home laundry conference to San Francisco for the second time, AHLMA put on a practical and an informative meeting at the Fairmont Hotel Nov. 3-4. Theme for this 14th annual conference was "Fundamentals and Frontiers of Home Laundry." Guenther Baumgart, who arranged the San Francisco meeting five years ago, was in charge again as AHLMA president. Conference chairman was Claire G. Ely, Maytag.

Just how far the industry has come in the past 12 years was pointed up in the opening skit, a clever presentation in which Frances Folsom, Hotpoint, Ruth Krustev, Maytag, and Jessie Cartwright, Norge showed the difference between "then and now," both in equipment and women's styles. Home economists, too, have learned new sales and demonstration techniques, it was brought out.

New fabrics, fiber identification, standards were covered as were problems in teaching home laundry methods and demonstrating equipment.

Among the most popular sessions were: Industry Plain Talk, in which AHLMA representatives and editors of consumer magazines discussed recent developments needing clarification; The Most Frequent Consumer Laundry Problems, in which a homemaker and a magazine home service director put the most frequent consumer laundry problems before AHLMA's home economists committee.

AHLMA men on Industry Plain Talk panel: Harry Kane, Whirlpool; Frank Lindsay, Maytag; William Hullsick, Kelvinator; Frank Spangler, Westinghouse; Harlan Besse, Hotpoint

Editors on Plain Talk: Elizabeth Sweeney Herbert, McCall's; Jane Cornish, Good Housekeeping; Virginia Thabet Habeeb, The American Home; Maxine Livingston, Parents'

Subsidy Retained

A program under which Tacoma City Light pays a $50 subsidy to home-owners who add 150-amp service will continue at least until the first of the year, following approval by the utility board. John D. Ferguson, City Light superintendent, told the board that 280 persons had taken advantage of the program since it was started five months ago.

Four members of the board voted approval of the program but the fifth, E. K. Murray, voted against it. "Pretty soon the gas company will give $75," and eventually City Light would be installing all electrical outlets free, Murray commented.

The program, described as "a pretty good deal" by A. A. Bradley, another member of the board, is designed to encourage the installation of electric washers, dryers and other equipment.

Business Women Invited

About once a year the career girls in Pueblo are invited to a luncheon by Southern Colorado Power Home Economics Department. There they are shown by demonstration how to make up well-balanced meals for themselves and their guests with the use of table appliances. Last year the various nationalities of food were demonstrated at the same meeting. It is not a formal affair nor does it cater to a club of girls but invitations are sent to women in business in the community. The affair is very popular and has brought a favorable response to the company.

► A revised and enlarged edition of the booklet **How to Insulate Your Home for Electric Heating** has been issued by the National Mineral Wool Assn. Single copies of the new booklet are free. Quantity prices, postpaid, run from 15¢ each (1,000 or over) to 25¢ each (2 to 25). Write to National Mineral Wool Assn., Rockefeller Center, 1270 Sixth Ave., New York 20, N. Y.

Use Appliance Plug-in Center to Demonstrate It

Use of a table appliance plug-in center is effectively demonstrated by Southern Colorado Power Co. home economists by using one themselves in a demonstration table. The circuit breaker protected unit is mounted on the face of the display table so that the audience may see it. Appliances being demonstrated on its top are plugged into it. The timers are visible and an explanation is given of its convenience and usefulness. Such tables are fed with a heavy-duty cord back to a range outlet to provide ample capacity. A point is made of this to show that where properly installed in the home several appliances may be operated at once without tripping breakers or blowing fuses. The photograph illustrates one in use at a cooking school for junior high school girls who did all of their work on the table using the device

Appliance Use and Care Shown at Arizona Institutes

An appliance Equipment Institute for home economic teachers, the second annual session, was held recently in Pueblo. It was sponsored by Southern Colorado Power Co., San Isabel Electric Assn. and Colorado Central Power Co. and was coordinated with a similar institute in Phoenix by Arizona Public Service and Salt River District. Some 90 to 95 attended and the teachers were given certificates for attendance, which helped upgrade their credits from the school districts from which they come.

Whereas the first such institute last year covered the major appliances, this one specialized on table and portable appliances generally. Factory specialists participated to bring to both institutes the basic information on appliance use and care.

The Arizona institute was held under the direction of Ruth Kruger, home service director for Arizona Public Service. That in Pueblo was under the joint direction of Margaret Reynolds, home service director, Southern Colorado Power; Margaret Tanner, home service counselor for the San Isabel Electric Assn.; and Vergia Powell, home service director of Colorado Central Power .

On the institute "faculty" were Nancy Kilpatrick, General Electric home economist in the Portable Appliance Department; Helen Mitchell Kyle from Waring Products Corp,; Aileen Page, home lighting specialist for General Electric at Nela Park; Eleanor Reed, product specialist for Whirlpool; Nellie E. Prall, General Electric kitchen and laundry school specialist; Ruth Laird of McCollum-Law, Westinghouse distributor; Earl H. Weiland, Singer Sewing Machine Co.; Kay Fields, decoration and interior design instructor at Emily Griffith Opportunity School; Jay Kelly, kitchen sales specialist of General Electric; Ed Wolf, Landers, Frary & Clark; Robert Lindsey, Sunbeam representative; and Larry Ringwalt, Toastmaster.

► **Lew C. Blackhall** has been appointed southern Alberta field representative for the **Electrical Service League of Alberta** with offices in the Calgary Electric Building, 2808 Macleod Trail.

► **A lease plan for lighting equipment** has been announced by **Westinghouse Credit Corp.** Leases can include installation costs of up to 50% of the selling price of the equipment and are available for two, three or five years. If desired, the lease includes an option for purchase at the end of the lease period.

New League Starts Program

Bylaws for the broadened Electric League of Southern California (EWEST, September, p 41) have membership approval and promotional plans have been announced by Mel Kennedy, director.

With expanded territory to include the entire southern half of the state, area chapters will be established to make participation more convenient. The chapter plan also makes it possible to gear programs to local problems. Chapters are being considered for Long Beach, Santa Ana, Van Nuys, San Pedro and other major shopping centers.

League activities will be enlarged to cover commercial and industrial fields as well as the residential business emphasized by the former Los Angeles Electric League.

Under league auspices both Southern California Edison and the Department of Water & Power will enlarge their promotional activities across the board.

Builders Plan Book

El Paso Electric Co. has published a Builders Plan Book covering three programs it will sponsor for builders in its area. The plan book is divided into three parts covering space heating, electric kitchen promotion and the Gold Medallion Home program.

The company has set up a new space heating rate for residential and commercial service. All kwh on residential service rates in excess of 400 per month will be billed at 1.6¢ per kwh during the months November through April for company approved electric space heating installation. For the commercial service rate, customer wiring must be arranged so that space heating equipment will be separated for metering and billing from the balance of the load. Electric space heating will be billed at 1.6¢ per kwh during the period November through April, for the remainder of the year all kwh will be billed on the standard commercial service rate.

The utility is also paying property owners an installation allowance for space heating equipment of approved make and specification.

► **Richland,** Wash., city **electrical department** has also begun the promotion of outdoor residential post lighting installations. The units, controlled by photoswitches, are installed for a flat monthly rate.

Heat Promotion in Sacramento

Sacramento Municipal Utility District, for the first time in its history, will conduct a campaign to acquaint homeowners with the advantages of electric comfort heating.

Guaranteed heating costs will be the theme of the entire campaign, according to SMUD officials. The promotion is based on the proposal that the cost of electric comfort heating in the average house of 1,300 sq ft—if the home is properly insulated and the heating system properly designed—should not exceed $87 a year.

Individual estimates of heating costs will be given and, if the heating bill exceeds the estimates for a three-year period, the Sacramento Valley Electric League, a SMUD-sponsored organization, will pay one-half the amount over the estimate.

An incentive program for electrical contractors, providing expense paid vacation trips, will be offered. Participating manufacturers will cooperate with the district in defraying the cost of the program.

A thorough training program for electrical contractors in sizing, installing and estimating operating costs of electric comfort heating will be provided.

in Benton and Franklin Counties

The Benton and Frankin County (Wash.) Public Utility Districts have started a new promotion of residential electric heat in the two-county area. The PUDs are pointing out in newspaper ads in Kennewick, Richland and Pasco that 7,500 homes in Benton and Franklin Counties are heated electrically and that eight out of 10 new homes in the Tri-City area are installing electric heat. Theme of the promotion is the low cost—of installation, operation and maintenance. Also stressed are convenience, comfort and safety.

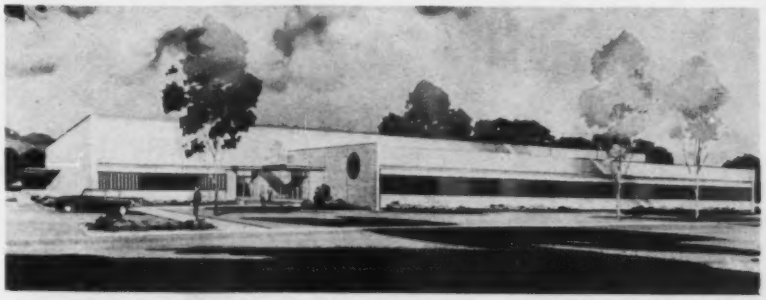
and in Spokane

"Electric Heat Costs Less Than You Think" is the theme of a fall promotion of electric heat by the IEEL.

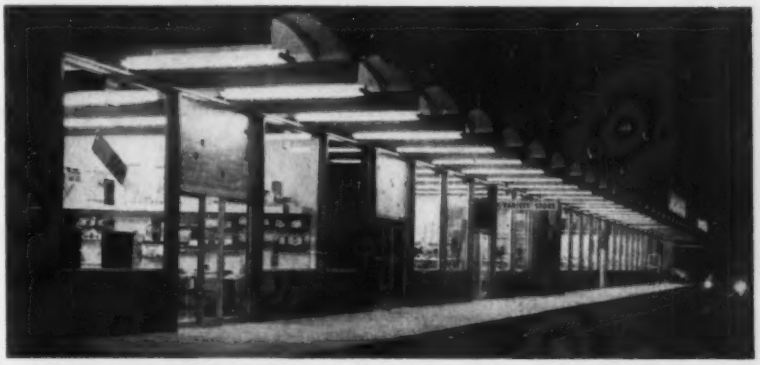
Newspaper ads feature testimonials by electric heat customers and an invitation to send for a free booklet, "Reddy Facts of Modern Electric Heat," furnished by the Washington Water Power Co. sales department. Advantages of electric heat and the booklet also are being plugged on radio and TV ads.

League officials hope the promotion will add substantially to the 15,000 residential customers already using electric heat in the league's territory, which covers the two-state service area of WWP.

New Warehouse and Office for G-E Appliance Division



G-E's Major Appliance Division is building this $1,000,000 warehouse and office building in Salt Lake City. According to Howard A. Oliphant, district manager, the structure, at 24th South and 8th West Streets, will have 78,400 sq ft of floor space, including an appliance service department and offices that feature the latest in mechanized accounting. An auditorium will seat 125 and will include a working kitchen on the stage; food service facilities for 150; a large display area. The building was planned for expansion to meet expected growth of the major appliance industry in the Salt Lake area



This all-electric shopping center near Salem, Ore., recently went on Portland General Electric Co. lines. Twenty-seven Mueller air-to-air heat pumps were installed on the roof by D. E. Cooper Co.

► A program to assist appliance dealers and service organizations in **training service personnel** has been started by the sales development department of the **Sacramento Municipal Utility District.** Last August the utility district eliminated its service division. W. Rad Coover, SMUD service coordinator, is in charge of the program that was kicked off with a training session for 35 servicemen employed by Sears, Roebuck & Co.

► **Westinghouse** has announced expansion of its **Total Electric Home program** into a new organization to be designated the residential marketing department. **J. G. McKinley,** former field manager for the Pacific Coast region Total Electric Home project, has been made regional manager of residential marketing, with headquarters continuing at 410 Bush St., San Francisco. **William H. Loeber,** former Total Electric Home marketing manager, is now manager of the residential marketing department.

► **Allan N. Stock** of Winnipeg has been appointed western Canada branch manager for **Maytag** Co. with headquarters at Vancouver, B. C.

► **Seattle City Light** has adopted the Gold Medallion Home Standard to supplement the Bronze Medallion program initiated last year. A booklet, Guide for Home Buying, will set out basic requirements.

*Trademark

"Superforms* sure fill the bill for a STANDARDS ENGINEER!"

"Fanner Superformed products meet our standards all along the line . . . *technical superiority, accurate manufacture, uniform quality, dependable performance.*"

More and more Standards Engineers . . . *the men who must find BETTER ways to do things BETTER* . . . are testifying that Superforms meet the highest standards. A-1580A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

Sacramento will be the scene of the next South Pacific Coast regional conference of Illuminating Engineering Society. Its host, Mother Lode Chapter, became a section recently when Roy Kreyser, regional vice president (center), presented the charter and installed Elton Harris as its chairman. Standing, left to right, are Del Goodman, secretary, Leslie Van Nostrand, vice chairman, Earl Storrs, retiring chairman, Kreyser and Harris. Seated are Mrs. Kreyser, Mrs. Storrs, past regional Vice President James Barnes, Mrs. Barnes. Mel Fenton, not shown, is conference chairman

Meetings Scheduled 'til July

DECEMBER

1-2—*Pacific Coast Electrical Assn.*, Administrative Services Section, Scottsdale, Ariz.

12-15—*Atomic Industries Exhibition*, Masonic Auditorium, AIF—Fairmont Hotel, ANS—Mark Hopkins Hotel, San Francisco.

JANUARY 1961

15-20—*Los Angeles Winter Market.*

23-27—*San Francisco Winter Market.*

FEBRUARY

2—*Intermountain Electrical Assn.*, annual conference, Hotel Ben Lomond, Ogden, Utah.

5-7—*Power & Communication Contractors Assn.*, 15th annual convention, Sir Francis Drake Hotel, San Francisco.

5-11—*National Electrical Week.*

11—*Snake River Valley Electric Assn.*, annual conference, Boise, Idaho.

23-25—*British Columbia Electrical Inspectors Assn.*, annual convention, Hotel Astor, Burnaby, B. C.

APRIL

5-9—*Electrical Maintenance Engineers Assn. of Northern California, Electrical Industry* Show, San Francisco.

6-7—*Pacific Coast Electrical Assn.*, Engineering & Operating Section, Ambassador Hotel, Los Angeles.

16-18—*Rocky Mountain Electrical League*, spring conference, Harvest House, Boulder, Colo.

17-18—*PCEA*, Business Development Section, Sheraton-Palace Hotel, San Francisco.

21-26—*San Diego Bureau of Home Appliances*, Electric Bldg., Balboa Park, San Diego.

26-28—*Northwest Electric Light & Power Assn.*, Engineering & Operation Section, Personnel & Safety Section, Purchasing & Stores Committee, Sheraton-Portland Hotel, Portland.

26-29—*National Electrical Contractors Assn.*, Tri-District meeting, Hotel Fairmont, San Francisco.

27-28—*PCEA*, Administrative Services Section, spring conference, Villa Hotel, San Mateo, Calif.

MAY

1-2—*Illuminating Engineering Society*, Intermountain Region Conference, Hotel Utah, Salt Lake City.

3-5—*IES*, South Pacific Coast Region conference, Sacramento Inn, Sacramento.

8-9—*IES*, Pacific Northwest Region conference, Davenport Hotel, Spokane.

17-19—*Pacific Coast Electrical Assn.*, annual conference, Sheraton-Palace Hotel, San Francisco.

20—*International Association of Electrical Inspectors*, three-chapter joint meeting; Northern and Central California, Sacramento Valley, Fresno, Calif.

24-26—*Northwest Electric Light & Power Assn.*, Accounting & Business Practice Section, Medford Country Club, Medford, Ore.

JUNE

1-11—*Construction Industry Exposition & Home Show*, 16th annual home show, Los Angeles Memorial Sports Arena, Los Angeles.

11-14—*Electrical Apparatus Service Assn. (NISA)*, national convention, Jack Tar Hotel, San Francisco.

WESTINGHOUSE POWERCASTING* helps Baltimore Gas and Electric build nation's first underground 240/480-volt residential distribution system

Stately Kingswood by-the-Severn is provided out-of-sight service at an installed cost competitive with overhead system

Five years of intensive studies at Westinghouse have helped make it possible for Baltimore Gas and Electric Co. to pioneer in servicing Kingswood with 240/480-volt underground distribution. *Although still in the early construction stages*, this project indicates an equipment investment and installation cost comparable with 120/240-volt overhead systems. Westinghouse is supplying transformers and meters, and a full complement of major appliances specially designed for 240-volt service.

Total Electric Living . . . a critical challenge to distribution investment dollars

The average home today consumes 3500 kilowatthours of electricity annually. In 10 years, average usage will rise to 10,000 kilowatthours.

Spending for distribution equipment alone is now at a rate of well over one and a half billion dollars annually. In 1969, this area of expenditures for expansion and modernization will virtually equal total electric utility system spending today. On the back of every dollar invested by each utility in distribution equipment today rides an implicit answer to many questions. Is this equipment contributing to system reliability? Can voltage be maintained at acceptable levels? Will this system be economical for load densities triple and quadruple those of today? Are the system design principles this equipment represents those that will be modern 10 years from now?

On the following pages, read how Westinghouse Powercasting has helped one utility answer these and other questions . . . with a completely modern system at Kingswood.

Presently planned for 72 Total Electric Homes, Kingswood, Maryland, will eventually accommodate 500. Heavily wooded, gently rolling acres descend to the Severn River where a fully equipped yacht club serves the community. A country club, golf course, swimming pools and other facilities fulfill a concept of estate living.

You can be sure . . . if it's Westinghouse.

*A Service-Mark of Westinghouse

Westinghouse

WESTINGHOUSE POWERCASTING*

with utility-developer cooperation makes possible massive demonstration

The custom-designed Total Electric Homes in Kingswood, Maryland, will be served electrically by the country's most unique distribution system . . . a direct burial 240/480-volt secondary system. For the first time anywhere, an entire new community will enjoy the benefits of an underground power supply . . . with 240/480-volt secondary service.

BG&E capitalizes on previous successful experience with buried power cable installations

Primary voltage at Kingswood is 13 kv. Primary and secondary cables will be directly buried in the earth. The utility decided that coverings such as concrete or creosoted planks are not necessary. Because of predicted high cable reliability, a radial system was selected.

Distribution transformers are Westinghouse single-phase 167 and 250 kva, pad-mounted type, set on a concrete mat. Permissible loadings are 160% of nameplate in winter, 120% in summer. Steady-state voltage drop from transformer secondary terminals to meter, and maximum voltage dip, are set at 4%.

Comparative system cost estimates prove out higher voltage plans

Overhead 120/240-volt and underground 240/480-volt systems were designed and field layouts prepared by the utility. Costs included 13 kv primary, transformers, secondary, services, metering and dry-type 240/120-volt autotransformers. The developer will bear the cost of excavating trenches, installing conduit under paved areas, and will build transformer foundations. Total investment costs to the utility for the *higher* voltage underground system are expected to be comparable with those for a conventional overhead 120/240-volt system.

# of Total Electric Living concept and the economies of HSV distribution

Developer, architect select Westinghouse to supply special 240-volt major appliances

Each Kingswood home is to be served by a 3-wire, 240/480-volt system. The meter is a Westinghouse 480-volt, 3-wire device. A Westinghouse autotransformer on the load side of the meter supplies 120-volt service to Westinghouse refrigerator, food waste disposer, other small appliances and centrally controlled lighting. The Westinghouse DSL load survey recorder will be installed as part of a joint BG&E-Westinghouse study of loads and load characteristics for future system analysis.

The developer of Kingswood, J. W. McCrocklin, and his architect, D. J. Olivola, selected Westinghouse to design and furnish heat pumps and major appliances suitable for 240-volt operation . . . de luxe broiler oven and platform range, built-in dryer, quick-recovery water heater, dishwasher. Appliance changes involved redesign of some components, and grounding of metal frames to noncurrent-carrying ground wire, separate from the electrical system, to insure safety.

Westinghouse heat pump brings modern air-comfort system to Kingswood

The largest single load device at Kingswood is the Westinghouse heat pump . . . a self-contained, air-to-air unit. Two 2½-hp compressors, two ½-hp condenser fan motors, one ¾-hp evaporator fan motor and 18 kw of supplementary resistance heating comprise this equipment. Based on an outdoor temperature of 0° and a structure heat loss of 75,000 Btu per hour, maximum half-hour demand will be 23.5 kw. In each home, maximum 30-minute load is 28 kw.

*A Service-Mark of Westinghouse

Westinghouse

WESTINGHOUSE POWERCASTING* is ready today to help you apply higher secondary voltages to a new residential area

Westinghouse proposes that you start today applying the principles of Total Electric Living served completely by an underground higher secondary voltage system to a new community

Westinghouse will:

1. Help you determine the precise distribution voltage level appropriate to your total system.
2. Help you engineer and select all distribution apparatus for this new system.
3. Negotiate all *higher* voltage appliances to be used in these homes.
4. Work with you and the developer-contractor to make this new residential area an outstanding example of Total Electric Living.

Call your Westinghouse sales representative today . . . ask for Powercasting service

*A Service-Mark of Westinghouse

Westinghouse

CP 1060

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LETTERS TO THE EDITOR

Wants Flex Prices

To the Editor:

Pleased to see your Estimator's Guide on page 125, September issue ELECTRICAL WEST. This should be a big help to all small contractors.

I think flex prices per outlet, residential and commercial, would also be a big help to our district in southern California as about 90% of the cities around Los Angeles district require a flex or EMT job.

Albert B. Carr
Electrical Contractor
La Crescenta, Calif.

Editor's note: We are passing along this suggestion to LeRoy Construction Service.

Like Editorial

To the Editor:

Please let me as a reader of a circulating copy of ELECTRICAL WEST commend you most sincerely about your editorial in the November 1960 issue.

This may surprise you, but I would like to know just how much 500 copies of this would cost me. It deserves distribution to others than in the electrical field. . . .

You may be interested in reading "The Towne Lecture" in July 1959 issue of *Mechancial Engineering*—this lecture was given by Walter Boveri in Switzerland.

Passing thought—After Santa Claus? The bill collector.

C. A. HILLEGASS
Los Angeles, Calif.

To the Editor:

Re your editorial in November 1960 issue.

Congratulations! Would that more of our editorial writers and so-called "thinkers" had the intestinal fortitude to say the same thing.

E. J. WALTENSPIEL
Phoenix, Ariz.

To the Editor:

We Didn't Get to Vote for Principle

I want to congratulate you for your editorial. It takes guts to write that sort, and a clear understanding to see what the real issues are.

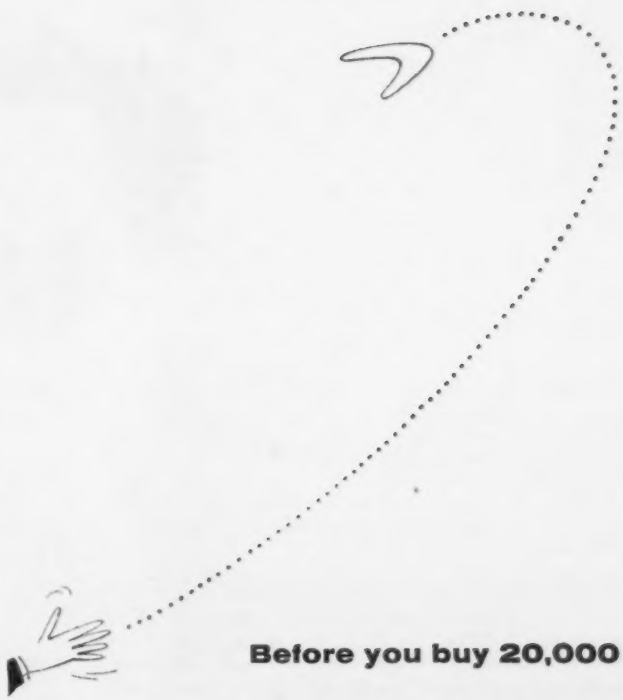
I do not agree with the entire editorial in its every word. I do agree with the basis and with most parts.

Certainly our next platforms, for '62 even before '64 should face the issues squarely. Maybe we can start now selecting and encouraging capable people to seek public offices in '62.

I wonder how Jack Kennedy would like it if we give him a Republican Senate and Congress in 1962. We can do it but we have to start now, working hard, selecting, registering, explaining the issues and how our candidates will stand on those issues.

I hope you can continue a bold policy of editorials that will hit many nails on the head. If we all hit enough we can achieve building the sort of country and life that holds the most for all of us.

R. W. HUTCHISON
Menlo Park, Calif.



Before you buy 20,000 "throw-away" photocontrols because they're inexpensive, consider:

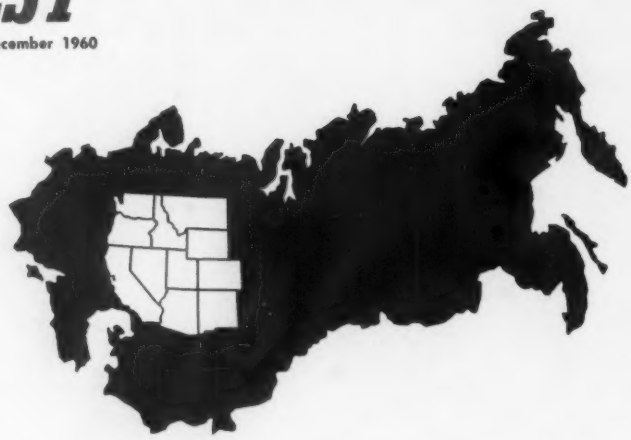
did you ever try to throw away a boomerang?

If you can't afford to replace a few thousand poorly-made photocontrols when they fail two or three years after installation, you can't afford the "savings" of their low first price. The Fisher-Pierce Co., 43 Pearl St., So. Braintree 85, Mass.

FP
FISHER PIERCE
Electrical and Electronic Equipment for Industry, Utilities and the Home
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

ELECTRICAL WEST

Vol. 125, No. 7 December 1960



Russian Roulette—American Style

We hope you will read and enjoy the articles by Russian authors. Energy transportation is receiving serious attention in the USSR just as it is in the Western United States. This then gives us a mandate to present the facts for the technical interest of Western specialists in the field. To further place the subject in focus, we have asked for comments by authorities on the subject. We thank Mr. Robertson and Mr. Starr for their contributions.

A word of caution. Your reading and the comments of Messrs. Starr and Robertson will convince you that it is impossible to relate rubles and kopecks to dollars and cents and reach economic conclusions that jibe with ours. The relative values of materials, energy sources, labor will lead the Russians to economic conclusions that are ridiculous in our framework.

We emphasize: **The economic solution for Russia is not necessarily best for us. Unless . . .**

Unless we see in the difference an affront to our national pride, or more likely, a chance to get a sputnik-scared citizenry to undertake federal power schemes as a means of "showing the Russians."

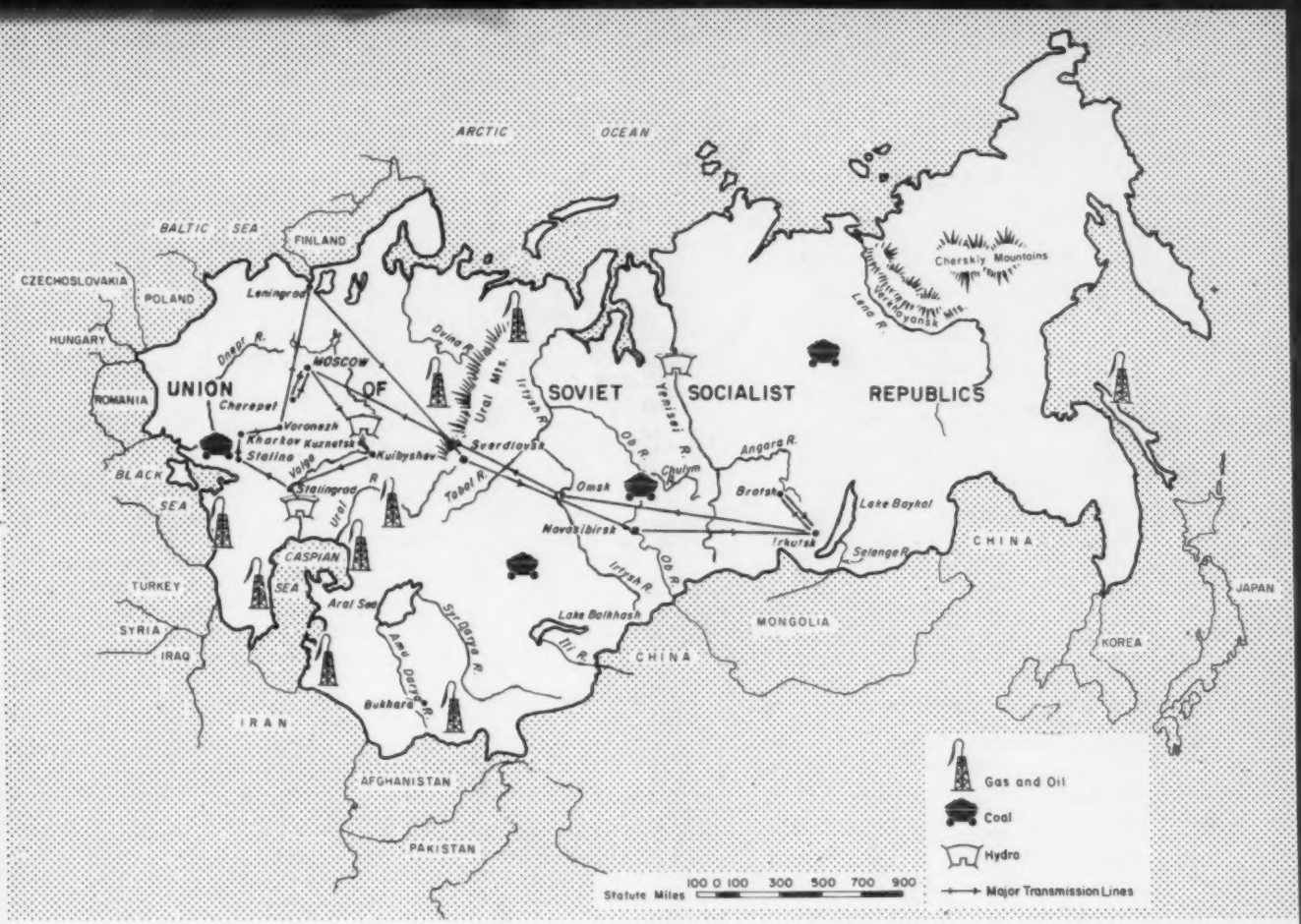
As you read the articles on the following pages, notice the emphasis on the economic solution; on the most efficient way. Notice the use of the words "profit" and "capital." Notice the eight-year payout on transmission facilities. **How can we escape the conclusion that these people in their desire to industrialize are behaving like first-class capitalists!** It's the only system that works and they know it because they tried pure communism and it fizzled and flopped.

In 1941 Philip Wylie wrote:

> *Communism broke down because men are not created equal, do not work equally, cannot be paid equally, do not have equal social and financial deserts, will not produce their best effort in a society that is not competitive, and cannot be made to work long or hard or with brilliance if they are not permitted to own, possess, buy, sell, and do business with each other.*

The social justice boys; the movers ahead to new frontiers; the cost-be-hanged-cause-we-owe-it-to-ourselves types had best conjure with this fact. **Our Russian rivals are emulating the business practices of the world's mightiest industrial nation—the one they would socialize.**

There is much to be gained from these articles. The Russian decision to go to ± 700-kv d-c is a courageous and technically exciting undertaking. In the light of the Russian findings, we should certainly re-examine our technical position. But to use these articles as political tools to socialize our industry is an abuse unworthy of any conscientious American.



Economic considerations of . . .

LONG-DISTANCE TRANSMISSION IN THE USSR

S. S. ROKOTYAN AND A. M. NEKRASOV, STATE DESIGNING INSTITUTE

The unification of power systems of the country's regions into unified grids is one of the principal lines in the Soviet Union's power engineering development. This is carried out depending on local conditions (distances, power capacity, etc.) by means of three-phase, 220-, 330- and 500-kv transmission lines.

The use of 500-kv power transmission permits transmission of 750 to 1,000 mw over one circuit to a distance of up to 620 miles. These lines are of great importance for the vast territories of the Soviet Union since they organize the unified power grids of the European part of the USSR, central Asia, central Siberia, the Soviet Far East, etc.

Lower voltage lines (330 kv) ensure the transmission of 400 to 500 mw over a single circuit to distances of up to 310 miles and are employed for setting up the unified power grids in the regions of north Caucasus, western Ukraine, etc., which cover smaller territories as compared to the power grid of central Siberia.

Powerful 400-kv transmission lines from the Volga hydro power station (near the town of Kuibyshev) to Moscow and to the Urals were put into operation in 1956-1959 (see ELECTRICAL WEST, March 1960). These lines will soon be shifted over to 500 kv. At the close of 1959 a 500-kv transmission line from the Stalingrad hydro power station to Moscow was commissioned. These lines have joined three major power systems of the European part of the USSR—those of the center, the south and the Urals—and initiated the foundation of a unified power grid of the European part of the USSR. By the beginning of 1960 this unified power grid comprised 25 local power systems operating parallel and producing more than 130 billion kwh in the course of 1959 alone.

By 1965 the formation of the unified power grid of the European part of the USSR is to be completed and unified power grids for central Siberia, north Kazakhstan and central Asia created. Subsequently these unified grids, connected with each other by powerful electric transmission lines, will serve to form the

Energy Transportation Costs

No.	Variant	Total capital investments rubles /kw	Cost of power in the Urals, kopecks /kwh
1.	Transportation of coal from Kuznetsk to 1,250 miles for thermal power stations under construction in the Urals	1,025	2.84
2.	Erection in central Siberia of thermal power stations at brown-coal deposits and transmission of electric power via ± 720-kv d-c line to 1,500 miles	1,165	1.76
3.	Supply of Bukhara gas via pipe line to a distance of 1,250 miles for the thermal power stations under construction in the Urals	1,040	1.57
4.	Construction in central Asia of thermal power stations operating on Bukhara gas and transmission of electric power from these stations via a d-c transmission line to a distance of 1,250 miles	1,060	1.28

unified power grid of the USSR.

The actual design elaboration of the problems involved in the unification of power systems and the construction of power transmission lines is preceded by research into a number of economic problems, the solution of which determines the sequence and terms of the unification of the individual power systems.

Location of Energy Sources

In elaborating power balances it has been established that in 12 to 15 years it would be economically expedient for the Central European, Northwestern and Urals economic areas, along with using local power resources, to utilize distant power sources located in the country's eastern areas which house three-quarters of the total coal resources and 80% of the hydro power resources of the country. That is why to join the power grids of the European and Asiatic parts of the USSR by means of transmission lines presents a major task in the establishment of the unified power grid of the country. These lines, besides carrying out the functions that are performed by intergrid and interconnection lines, should be able to transmit efficiently 30 to 50 billion kwh of electric power a year. Three possible variants for long-distance power transmission have been subjected to economic evaluation: transportation of coal by rail, delivery of natural gas by pipe lines and transmission of electric power over d-c or a-c superhigh voltage lines.

As example we cite the results of calculations for the power supply of the Urals in 1972-1975, to be carried out by using distant power sources (50 billion kwh/year).

When we compare the transportation by rail of Kuznetsk coal which has a caloric content of 5,500-6,000 kg-cal/kg (9,900-10,800 Btu/lb) with electric power transmission, we find the latter to be more profitable in spite of the somewhat larger capital investments involved. The annual service costs with power transmission are smaller and, in this case, the additional capital investments are compensated within two years. We find a similar picture when we compare the expenses involved in the supply of gas via pipe lines with the erection of power transmission lines. The latter is requited within approximately a year.

If electric power transmission via overhead lines was found to be economically more profitable than the long-distance railway transportation of coal or pipe-line transportation of gas, then the next engineering and economic problem to be solved was the choice of the power transmission system—direct or alternating current.

The technical solutions used in elaborating the variants of long-distance power transmission over a-c lines are based on the practice of the construction and operation of 400- and 500-kv lines, as well as on the elaboration of the problems of long-distance 600- to 750-kv a-c transmissions, which had been performed by Soviet research and designing institutes.

Similarly, the technical solutions of d-c super-high-voltage power transmissions are based on the experience gained in designing and building the Stalingrad-Donets Basin (Stalino area) d-c ± 400-kv, 750-mw power transmission line, about 295 miles long, and on new layouts developed by our research institutions.

Swedish Studies Cited

Layouts elaborated in the USSR and in Sweden have convincingly shown the transmission of electric power over 750-mw, d-c lines to become economically efficient, provided that the range of transmission is 466 to 621 miles and longer.

Comparative calculations of various types of d-c and a-c transmissions were made with the purpose of finding out the economic boundaries of the application of long-range, superhigh-voltage a-c and d-c transmissions. These included: intergrid transmissions without intermediate substations with reversible operating duty; transmissions linking powerful electric stations with the power grid with and without intermediate power take-off. Schemes and cost estimations were drafted for overhead a-c transmission lines on metal gantry supports and for d-c lines on T-shaped upright metal supports; for open-type a-c substations with automatic power transformers and air breakers.

How A-C Compares With D-C

At a magnitude of 2.5 to 4.0 billion kwh per year over a 500- to 750-mw circuit the economic limit for employing three-phase, 400-kv current lies within the range of 500 to 625 miles.

As the capacity and power to be transmitted increases to 2,000 mw on the circuit and to 14 billion kwh per year, the economic limit for employing three-phase, 600-kv current decreases to 310 to 500 miles. Beyond 500 miles, d-c is more economical.

In evaluating the different variants of power transmission, a-c vs d-c, the ratio of capital investments in the construction of a 2,400-mw transmission line, 1,500 miles long, has been found to be 1.5 to 2.0 times greater for a-c.

The lower cost of the transmission line itself favors d-c for long distances. The lower cost of a-c substations has the reverse effect, making a-c more favorable for shorter distances.

The future is bound to bring the reduction of the cost both of transmission lines and of substations,

converter and compensating devices. Thus, the above-mentioned economic boundaries for the application of a-c, established by the criterion of capital investment ratios, will probably undergo little changes.

Drawing on the above economic comparisons, the considerable advantage of transmitting d-c over lines with a length of over 932 miles and transmission power of over 1,500 mw per circuit has been established.

This called for a more detailed elaboration of a new series of layouts for long-distance power transmissions from the country's eastern areas to the Urals and the center.

These layouts had the following prerequisites:

Power transmissions with the technically greatest possible voltage should be employed for the economic solution of handling 30 to 50 billion kwh over distances of 1,250 to 1,500 miles.

With due consideration of the progress in the field of high-voltage engineering the chief trend should be toward the transmission of 700-kv a-c and ± 700-kv d-c.

All layout variants provided for power transmission with intermediate substations for connection with the power systems located along the route of the long-distance transmission. The intermediate substations may be built either simultaneously with the erection of the long-distance power transmission or after it has been erected, as the local power systems develop.

The boundary between the field of application of a-c and d-c has been determined from the equality of rated expenditures per kilowatt-hour by the formula:

$$C = C_0 + \frac{1}{T} \cdot K$$

where:

C_0 = the prime cost of transmitting 1 kwh

K = the full capital investments into the electric transmission of 1 kwh of power, including the cost of step-up substations, step-down terminal and intermediate substations, lines and compensating devices.

T = the rated term within which the capital investments will be justified, i.e., 8 years.

For trunk transmissions with 1,500 to 3,000 mw per circuit the boundary between the zones of application of 700-kv a-c and ± 700-kv d-c lies in the range of 310 to 435 miles. The limit of the application of a-c for the same kind of transmission with two intermediate substations is 528 to 590 miles.

In order to evaluate the transition from a-c to d-c, additional comparisons were made of 700-kv a-c with ± 700-kv d-c, allowing the rated expenses per kilowatt-hour transmitted over an a-c line to be 10% higher than similar expenses for d-c. In this case the zone of application of a-c extends only 186 miles for either trunk transmissions or for those with intermediate substations.

The efficiency of d-c power transmissions is 91 to 92%, including the losses sustained at transformer substations.

In elaborating the concrete design materials the comparison of a-c and d-c transmissions of equal carrying capacity yielded results that are cited in the accompanying table.

Conclusions

The design layouts performed with due consideration of the progress to be expected in the development of high-voltage engineering show the application of d-c to possess economic advantages in lines of great length and with sufficiently great power transmitted. The capital investments and cost of transmission of electric power by a-c in these areas are 1.5 to 1.8 times higher.

Power Transmission Costs Compared

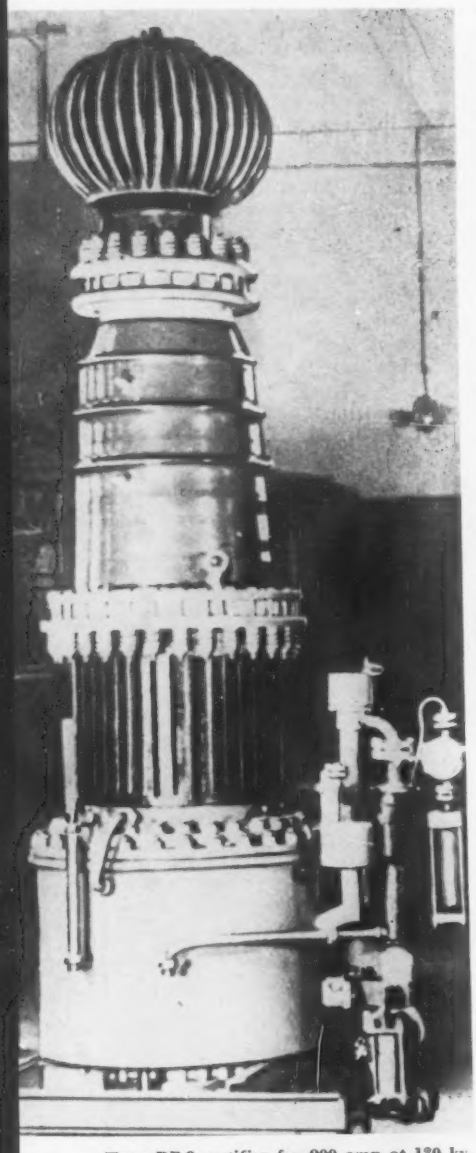
Specification 1	Thermal stations in central Siberia to the Urals* 2	Hydro power stations on the Yenisei to the Urals* 3	Hydro power stations on the Yenisei to the Urals† 4
Watts transmitted, mw	7,200	4,800	4,800
Power, billion kwh/year	50	28.8	28.8
Length, miles	1,367	1,500	1,500
Voltage:			
(a) a-c transmission, kv	700	700	700
(b) d-c transmission, kv	± 700	± 700	± 700
Number of circuits			
(a) a-c transmission	3	2	2
(b) d-c transmission	2	2	2
Capital investment ratio, rubles/kw			
(a) a-c transmission	742	616	586
(b) d-c transmission	432	328	353
Cost of transmission of 1 kwh, kopecks			
(a) a-c transmission	0.75	0.52	0.49
(b) d-c transmission	0.42	0.30	0.32

* *Without intermediate substations.*
† *With two intermediate substations.*

D-C transmission is a subject of great technical interest. Here is the design story on Russia's first . . .

± 400-KV D-C TRANSMISSION LINE

E. S. GROISS, A. V. POSSE AND V. E. TURETSKY, THERMAL POWER DESIGN INSTITUTE



Type BP-9 rectifier for 900 amp at 130 kv. Investigations into a number of rectification schemes led to a system incorporating eight six-phase bridges connected in series, for a rectified voltage of 100 kv each

The over-all trend in the Soviet Union is to pool all the individual power systems into an integrated power grid. Accordingly, the current Seven-Year (1959-1965) Plan envisages the construction of a number of transmission lines intended to handle large amounts of power. Apart from a-c transmission systems, d-c transmission lines will also be built, particularly where they promise a better economic effect.

One such ± 400-kv d-c transmission line is already being built. Intended to handle large blocks of power, the line will connect the Stalingrad hydro-power station with the Donets coal basin (Stalino Area) and will be the chief high-voltage link between the central and the southern power systems in the European USSR. The line is to provide for the exchange of operating and stand-by power; to equalize the operation of thermal power plants; to improve the performance of water power stations and to give an outlet for their high-water power.

The selection of current (direct or alternating) for the Stalingrad-Donets Basin line has been the subject of detailed design work and large-scale technical discussions.

The comparison of the outlays for a 400-kv a-c line and a ± 400-kv d-c line has revealed that they would be nearly on a par, as the line will be relatively short (295 miles).

The choice of direct current has also been governed by the consideration that it will serve as a stepping stone to long-distance transmission lines for large amounts of power in the future. This, in particular, is true of power transmission from the Siberian power stations to the Ural industrial areas where the use of direct current will give a sizable economic gain. Besides, although this d-c line as such promises no economic advantages, it offers new technical and operational advantages important for an intersystem link. Direct current results in asynchronous coupling which allows independent frequency regulation; it facilitates automatic and program power control and substantially reduces the effect of breakdowns in one system on the operation of the remaining ones. The reliability of service is also improved, as earth can be used as the return wire in an emergency.

The way for the first commercial d-c transmission line intended for large amounts of power has been paved in the Soviet Union by the pilot commercial Kashira-Moscow line commissioned in 1950. Intended to operate at 200 kv, the line transmits 30,000 kw over 70 miles. Extensive studies at research establishments and on the pilot line into a variety of rectification schemes, mercury-pool rectifiers and other equipment, coupled with design and developmental work at Soviet electrical engineering plants, have all provided a good basis for the Stalingrad-Donets Basin d-c line project.

Basic Parameters and Transmission Configuration

The power handling capacity of the line has been set at 750,000 kw with an overload of up to 900,000 kw. These figures take into account the various operating duties of the power system pooled.

The 800-kv voltage (± 400 kv relative to earth) has been chosen in the light of economic considerations and advances in high-voltage techniques.

Comparative investigations into a number of various rectification circuits have led to a system which incorporates eight six-phase bridges connected in series, for a rectified voltage of 100 kv each.

Each transformer substation consists of four identical units, each made up of two rectifying bridges and one transformer. Both the individual units and the system as a

complete unit operate 12 phase.

At the Stalingrad hydro-power station, the eight hydrogenerators are direct connected via common transformers to the rectifying bridges and the 220-kv station bus bars. The power produced by the generators can be partially transmitted over the d-c line to the Donets Basin and partially fed into the 220-kv bus bars. In both cases, a single-step transformation is effected. When coming in from the Donets Basin, the power arrives at the 220-kv bus bars to be distributed together with the power supplied by the station generators.

The reactive power requirements of the rectifying circuit at the Stalingrad substation are provided by the station's generators, while at the Donets Basin substation this purpose is served by a bank of static capacitors connected to the 220-kv bus bars.

Center Tap Grounded

At the two substations, the center taps on the d-c side are grounded via suitable operating grounders able to handle the rated transmitted current for a long time. Such a grounding system divides the line into two practically independent semicircuits with a voltage of ± 400 kv relative to earth. Should one semicircuit go out of action, the other remains operative, and the working transmitted current passes through earth.

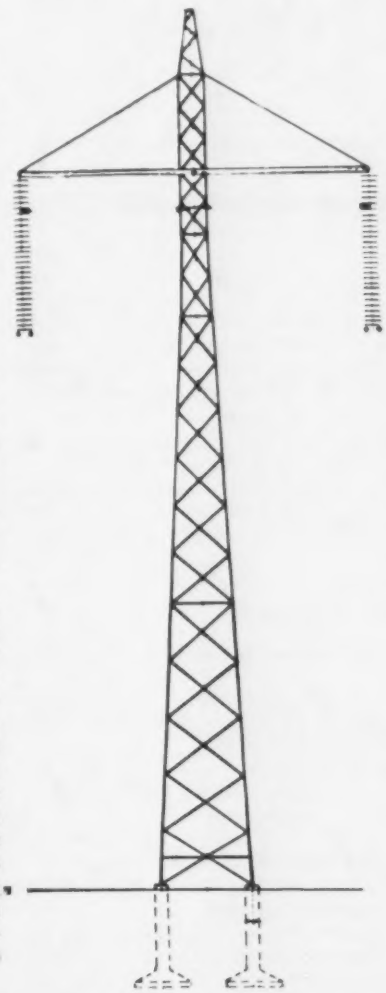
A schematic diagram of the rectifying bridge is shown. To ease the work of the rectifiers and to enhance the reliability of the rectifying system, each arm of the bridge will include two rectifiers connected in series. Normally, each rectifier will operate at half the rated voltage. Only in the case of an arc-back or failure of one rectifier will the other have to carry the full voltage for a short period of time.

Placed between the terminals of each bridge will be a circuit of two rectifiers, which will be normally nonconductive and a shunting disconnector also normally disconnected. In the case of a failure (an arc-back, etc.), the grid protection will make the operating rectifiers nonconductive and render the shunting rectifiers conductive. This will divert the current from the main rectifiers. The reversal takes place automatically in a split second. Should troubles occur which cannot be eliminated by this procedure, the shunting disconnector is thrown out.

The other provisions made in the transformer stations include radio interference suppression as well as the suppression of high-frequency oscillations that otherwise might find their way into d-c and a-c lines to interfere with the operation of wire communication.

An automatic control system maintains the desired parameters of power exchange and line operation, while quick-acting grid regulation devices provide for the stability of the rectifying circuits in transient and fault processes occurring in the d-c line or adjacent a-c networks.

Depending on the nature of failures, they can be automatically localized within one bridge, or one rectifying unit (two bridges), or one semicircuit. The necessary provisions made in the basic circuitry supported by automatic facilities thus enhance the reliability of line operation and make the line more flexible for future growth.



Intermediate support on the Stalingrad-Donets Basin d-c line. Insulator strings have 22 12½-in. individual insulators

Overvoltage Protection and Insulation Levels

Internal overvoltages will be limited by automatic program-controlled operation at transient and fault processes, by damping r-f and a-f oscillations, by the forced equalization of voltages through all the stages of rectifying circuit, and by the use of suitable dischargers.

The dischargers will not have to trip out load currents. After they have tripped, the current will be automatically stopped by the grid protection, which will then restore the normal operation of the rectifying circuit. The protection system will accurately keep the voltages, acting on the insulation of the rectifying circuit components, within the rated limits. Accordingly the equipment may have differentiated insulation dependent on its place relative to the circuit ground point.

Insulation Levels

For the line terminal, the rated ratio of internal overvoltage to the working voltage is 1.7. For the insulation elements within the differentiated rectifying circuit, this ratio is somewhat higher, rising to 2. The insulation of the high-voltage equipment is to be tested for breakdown by applying elevated direct voltage. The test voltage for the equipment proper has been chosen depending on where a given component is brought into the rectifying circuit. The internal insulation of the equipment at the terminals is to be tested for a voltage of 870 to 900 kv, and 300 to 750 kv as far as the other equipment is concerned.

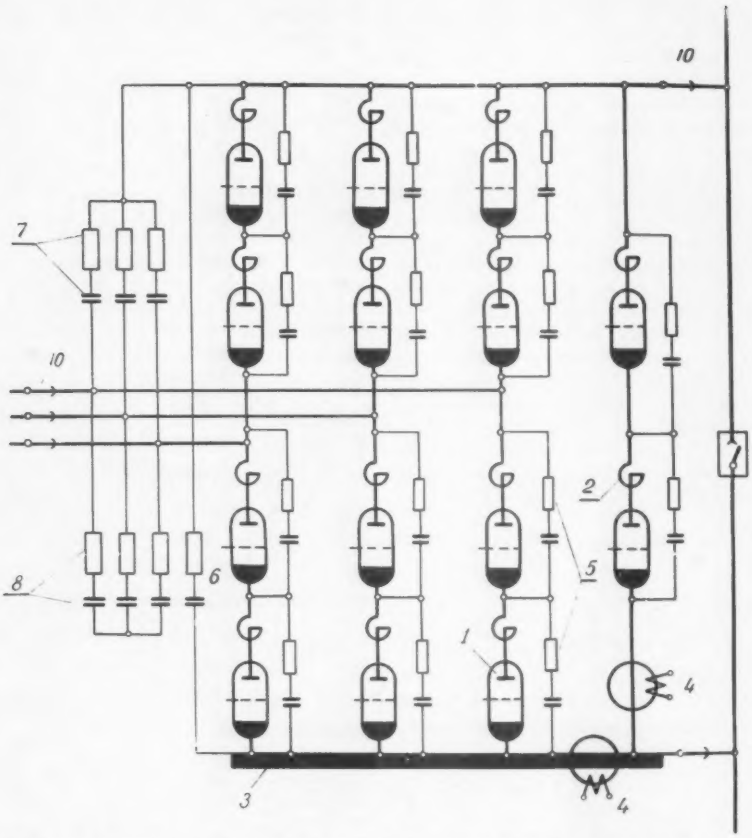
The external insulation of the equipment installed out-of-doors will mainly be tested for wet discharge parameters with both the instantaneous and sustained application of direct voltage.

The overhead line will be protected against atmospheric overvoltages much in the same way as an a-c line of the respective class. As to the atmospheric voltage surges reaching the substation, they will be efficiently limited, as reactors of high inductance will be connected in series with the line.

Basic Substation Equipment Design and Layout

The key component of the transformer substation is the one-anode rectifier—a sectionalized anode unit incorporating an external bleeder, an oil-cooled tank and a pump to maintain the desired vacuum.

The dominant consideration that



Schematic diagram of the rectifier bridge. Reference 1 is the rectifier; (2) the anode reactor; (3) the intermediate potential platform carrying the rectifiers; (4) the d-c measuring transformers; (5) the RC network to equalize the voltage between bridges while (6) performs the same function within the bridge. References 7 and 8 are RC networks to dampen oscillations and 9 and 10 are the shunting and main disconnectors

governed the development of the main transformers, line reactors, isolating and measuring transformers was that the voltages affecting the main insulation under stationary conditions have a large constant component.

The dischargers are a system of air gaps using graphite electrodes, which are contained in porcelain casings. The dischargers have devices which reduce the scatter of breakdown voltages (the scatter lies within ± 7%). Provisions are also made to speed up deionization after the current has passed the gap, and to quench the arc—the deionization time can be as long as 0.2 second.

The instrumentation of the transformer substation includes d-c measuring transformers, direct voltage measuring transformers, measuring bleeders, electric-vibrational and electronic oscillographs, some of which have memory elements, indicators showing what deviations may occur in the operation of the rectifiers, and other instruments.

The rectifiers at the transformer substations will be installed in closed premises so as to obtain the desired temperature conditions. The Donets Basin substation will have a special rectifier hall while at the Stalingrad substation they will be mounted in the power house.

The Transmission Line

The vital statistics of the transmission line can be tabulated as follows:

Number of conductors	two per phase
Conductor material	steel-aluminum
Cross-sectional area of aluminum core	0.9 sq in.
Conductor spacing	15.8 in.
Current density	504 amp/sq in.
Heat loss at rated power	2.6%
Disruptive potential gradient at conductor surface	68.6 kv/in.
Expected corona loss (annual average)	10.3 kw/mile

Two factors have been taken into account in choosing the length of insulator strings: first, the effect of maximum internal overvoltages in rain and, second, the effect of the working voltage under the most adverse weather conditions (fog, drizzling rain) and with the contaminated surface of the insulators. As the internal overvoltages are expected to be at a low level, the requirements are approximately the same in both design cases. The intermediate supports will have strings of 22 insulators 12.6 in. in diameter and 8 in. long.

The distance between the phases will be 36 ft, while the clearance to the ground will be approximately 25 ft.

Tower Design

A comparison of possible intermediate supports has led to a T-shaped support made of low-alloy steel and to be mounted on a foundation of prefab ferro-concrete. The intermediate supports have been designed for rated duty loads with unbroken wires. To avoid fault loads (broken wires), the conductors are to be secured in the supporting strings by means of blind clamps, which have a limited holding strength.

Each intermediate support tips the scales at 3.4 tons. On the average, the support-to-support span is 1,200 ft. To protect the line from atmospheric overvoltages, there is one ground wire with a protection angle of 30° of arc.

Plans are considered to use the line wires for VHF communication, remote control and telemetering.

Transmission Efficiency

The efficiency for the rated transmitted power is 93.5%. At lowered loads, the efficiency will be maintained at a high value by reducing the losses at the substations. This can be effected by disconnecting some of the transformers and bridges and by operating the line at a lowered voltage—at 600 or 400 kv.

The losses in the transmission line can be basically broken down as follows:

	Percentage of all losses
Losses in line	45.6
Including: heat loss	39.5
corona loss	6.1
Losses at substations	54.4
Including: transformer loss	30.3
rectifier arc loss	5.3
others	18.8

COMMENTS FROM THE INDUSTRY

The following discussions are by two eminent Western authorities in the field of high-voltage transmission.—*Editor.*

L. M. ROBERTSON
MANAGER OF ENGINEERING
PUBLIC SERVICE OF COLORADO

". . . I think the main point is that there are certain areas where there are population centers and therefore electrical power requirements. This naturally means that subtransmission and distribution is required if generating plants are located in the area. As the area expands these facilities will also be expanded and there comes a time when adjacent areas are so close that interconnections can be made at low cost and derive the benefits of load factors, etc. However, to go to extremely long distances with electric transmission is quite expensive. A cost of 2 mills per kwh in itself does not sound very expensive, however, it requires an extremely favorable fuel cost to offset this penalty. This does not take into account the different plant investment costs, which are a function of the fuel used.

"I certainly am in favor of obtaining all the economics you can from interconnections, but the costs can become very high. It is time someone hung up some flags on costs of transmission. EHV is very good in difficult and expensive right-of-way cases and in heavy load density areas or very low cost, remote generation.

"I read with great interest and, in fact, studied the article by the Russians. However, I find that when they begin to talk economics their statements are very fuzzy. As an example, they talk about economic comparisons. I don't know what this means because of their philosophy of government. With government-owned industry, taxes, insurance, interest, depreciation, etc., are not mentioned and I am not sure they are taken into account. In fact, I don't even see where they talk about operation and maintenance costs so that any comparison of our economic system with the Russians' "economics" is impossible.

"There is no apparent common basis for economic discussions. In fact, I am not even sure of their figures on first costs, as you do not know what might be included for overhead, development, research and taxes which go into producing the equipment. In other words, they can produce any figure they want in any way they want."

E. C. STARR, CHIEF ENGINEER
BONNEVILLE POWER ADMINISTRATION

". . . The Bonneville Power Administration has made preliminary investigations into the d-c transmission field—the latest of which was in connection with the proposed Pacific Northwest-California intertie. Our investigations, for the most part, have been concerned with the comparative economics of a-c and d-c transmission and did not enter into technical aspects of the problem.

"The construction of the Stalingrad-Donbas d-c line is being undertaken by the Russians not on the basis of any economic advantage but rather to gain technical and operating experience in the field of d-c transmission. The investment required for 400-kv d-c and 500-kv a-c are about equal for rated loads over the 294-mile length. The decision favoring d-c transmission was based on the assumption that the line is to serve as an important transitional phase for future extra large and long transmission lines for which d-c shows promise of economic advantages.

"In the Pacific Northwest the average transmission distance for the relatively well integrated Columbia river power system is approximately 150 miles. By comparison transmission distances in the USSR are much greater; load density patterns are different; and also there is a lack of large integrated system pools. Several decades ago the thinking in the U. S. was that generation sources and load centers would be widely separated requiring considerable long-distance transmission. Since that time developments such as TVA, Columbia River and Niagara Falls have demonstrated that power-consuming projects follow the availability of generation. At least in this country, a load pattern has developed which precludes long-distance transmission except perhaps for some presently proposed interregional exchanges.

"The principal limitation to d-c transmission is the cost of terminal stations. A d-c transmission line has lower line costs than a corresponding a-c line; however, terminal converter stations are required which cost from two to three times more than corresponding transformer stations. Recent economic studies indicate that the minimum transmission distance required to make d-c competitive with a-c is approximately 350 miles.

"One of the greatest obstacles to d-c transmission is the problem of switching. Switchgear designed for a-c operation takes advantage of zero current every half cycle. Under d-c conditions zero current does not exist and the energy of the circuit must be dissipated before it can be interrupted by circuit breakers. Energy dissipation is obtained by means of grid control of the converting equipment. This means of protection is adequate as long as "point to point" transmission is considered; however, until the problem of d-c circuit breakers is solved, it will not be possible to establish high capacity d-c networks.

"Due to the presently imposed economic and technical limitations, we conclude that high-voltage d-c transmission is limited to long distance and transmission of large blocks of power without interconnection points. The proposed interregional lines in the USSR are ideally suited to the use of d-c transmission. The U S. on the other hand, from the standpoint of geography, load pattern, generating centers, etc., does not lend itself particularly well to d-c transmission. Long distance interregional ties are probable future developments for which d-c transmission might possibly be utilized. Present studies by BPA toward increasing system capacity are being directed toward higher a-c voltages, bundled conductors and series capacitors. With several 345-kv circuits in operation we are making economic studies on 460—500-kv transmission utilizing single and bundle conductors."

While the official rate of exchange appears to be four rubles for one U. S. dollar, the tourist rate appears to be something different.

From "Report of Visit to USSR" by a delegation from Canadian electric utilities: "Electricity costs for the year 1959 were quoted as summarized in the following, the units being kopecks per kilowatt-hour or mills per kilowatt-hour at the tourist rate of exchange ($1 U. S. = 10 rubles = 1,000 kopecks):

GENERATION COST AT HIGH VOLTAGE BUS

	Hydraulic	Thermal	Weighted Average	Gross Cost Including Transmission & Selling
Amortization	1.62	1.20	.....	1.84
Wages	0.14	0.71	.....	0.75
Fuel	0	5.60	.....	4.18
Repairs, etc.	0.29	0.48	.....	1.23
Total	2.05	7.99	6.92	8.00

The selling price for electricity to residential and commercial customers (except churches which are charged 250 kopecks per kwh) is 40 kopecks per kwh and a variable rate is used for industrial customers depending on the importance of the industry to the national economy. Figures were quoted from 4 to 12 kopecks per kwh for the latter.

The depreciation rate for hydro concrete dams and lands was given as 2% composed of 1.85% depreciation and 0.15% maintenance. Average rate for hydraulic plant equipment is 6.5% and replacement costs can be charged to the depreciation fund up to a limit of 40%. For thermal plants, rates of 2.25 to 2.70 are used for buildings and 5% (5,000 hours-per-year use) to 9% (8,760 hours-per-year use) are used for thermal plant equipment.

Portland General Electric presents

SOMETHING NEW IN 115 KV

SCOTT P. SAMSEL, ASSISTANT TO THE SUPERINTENDENT OF DISTRIBUTION, PORTLAND GENERAL ELECTRIC CO.

A new look has been added to the 115-kv transmission picture by a radical change from suspension construction to an all-post construction for tangent structures. In 1959, Portland General Electric completed and energized approximately nine miles of 115-kv transmission line between two of the company's big substations. The line runs from station E inside the city to West Portland substation about fives miles southwest of the city limits.

Appearing to be of lower voltage, line blends nicely with surrounding area

This line crosses all types of terrain that a level transmission line would usually encounter, plus most of the obstacles of a line built in rugged country. It starts in the industrial heart of the city of Portland, goes through business, residential and apartment areas, under a high bridge, along a main highway in a canyon, along the canyon wall with trees on both sides of the line, through a city park into an expensive residential area with view property, and out through suburban city and rural country. It crosses two main state highways, several heavy feeder roads, and two 57-kv transmission lines. The line starts at about 50 ft above sea level and climbs to approximately 800 ft into the Green Hills in the west part of Portland, then drops to 300 ft and ends at the West Portland substation which is at the 425-ft level. The area is generally a light loading area although some icing could occur in small sections of the line.

Major Considerations

Some of the major considerations that controlled the design of this line and, of course, determined its structures are as follows:

1. The line goes through a large area of a major city's streets.
2. It passes several fine apartment buildings.
3. Business areas are not strictly major, but are fairly extensive along the route inside the city.
4. In the residential and apartment areas a large amount of the property is located on what is classed as "view lots" that enjoy beautiful views.
5. Along part of the line, rights-of-way were only 10 ft wide.
6. The state highway and city parks people were, of course, interested in maintaining a very narrow trimming area along the highway and in the park.

For these reasons the structures were built as shown.

Some of the cost, structural and installation problems may be of interest.

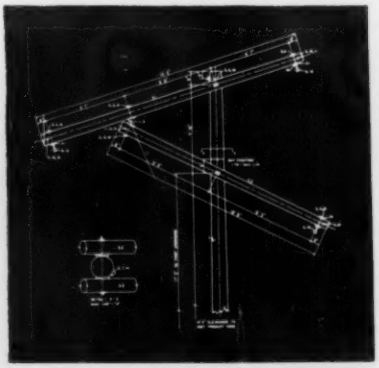
Fourth Type

Four types of structures now in use on the PGE system are the wishbone, H-structure, pole top post and arm suspension and pole top post and side mount insulator. The pole top post and side mount insulator is the most expensive per line mile as far as material is concerned.

Comparing the useful strength of the structures will depend upon the span lengths, wire size and many other factors involved in a particular job. This will have to be left to the designer. The all-insulator structure will allow some unusual application in small angles, take off from vertical corners, short spans, etc. Since it is so easy to misapply these insulators because of their easy adaptability, careful design and close control during construction is necessary.

Construction with these pole top and side mounted posts did not seem to bother the line crews. They worked out their own tricks to hang the stringing sheaves and installed the poles completely framed.

An interesting thing about the station E to West Portland 115-kv



line is that an 80-ft pole was average in some sections. There were also 100-, 105- and 110-ft poles to be set, usually where heavy equipment could not be used. A large mobile commercial crane was used where possible throughout the job. Poles were normally set completely framed in some real congested corner pole locations in the city, which included secondaries, two primaries and an 11-kv line. In the country the poles were set in the hot 12.5-kv completely framed.

Aluminum Conductor

The conductor for the line is 795 mcm, all aluminum. Pulls of approximately 8,000 ft were made wherever possible. Pulling ropes were 1⅛-in. manila hemp. All pulls were made under tension. Unless something unforeseen happened, all three wires of a section were pulled and sagged in a normal day.

The upper part of the pole is not bored. The pole-top unit is banded to the pole and the two lower side-mount insulators are installed with one ¾-in. bolt and one ⅝-in. bolt. These units are not bonded together.

Lower Radio Noise

During construction, the first section was energized and tested for radio noise. According to the report, it was quieter than some 57-kv lines. It was also checked in a slight rain with no increase in noise level.

The complete line was energized in December 1959, and since that time there has been lots of rain and several snow storms. There has been only one case of trouble to date on this line, caused by a tree. There have been no other complaints.

Although insulators appear "king size" on the ground, the crews liked the configuration and say it is nice to work. Note that the center post shown here is a two-piece unit

The entire line was built with only one major property owner objection and two or three minor ones. These objections did not pertain to the type of construction but just the transmission line itself.

Conclusions

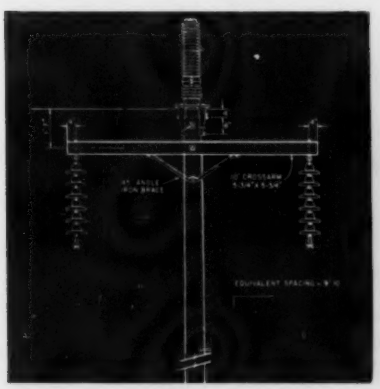
This type of construction will solve many of the problems that are inherent in city construction.

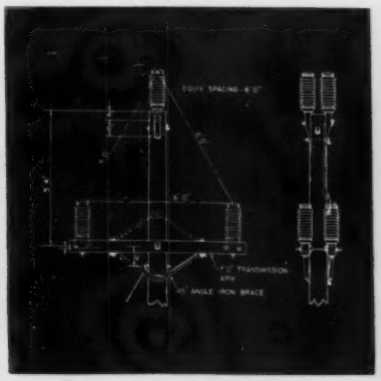
The material cost is at present more expensive but the total cost may eventually become very competitive. It is estimated that its cost, at present, is about $1,000 more per mile to build than its nearest substitute.

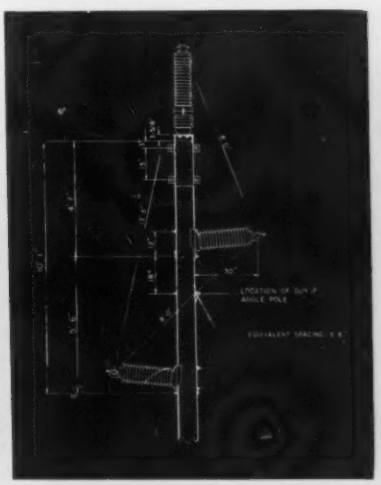
Crews like this configuration and say it is nice to work. As far as PGE can determine, there have been no complaints regarding the aesthetics of this line. It seems to blend very nicely with the area and looks like a lower voltage line.

The Portland General Electric Co. is very proud of the crew and the ingenuity it showed while doing this job. Many of the methods developed on the job will be used on future jobs.

The evolution of all post tangent structures at Portland General Electric. In the early 1950s the "wishbone" structure (opposite) was standard, later giving way to pole top post-arm suspension. In 1958 the post-type insulator structure (center) was developed for 57 kv and from this basic design came the idea for the present 115-kv structure (right)



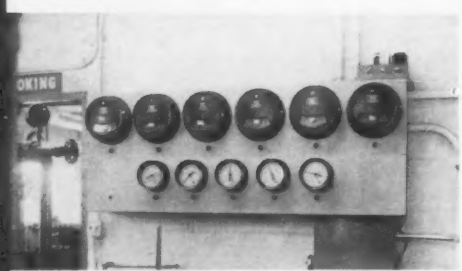


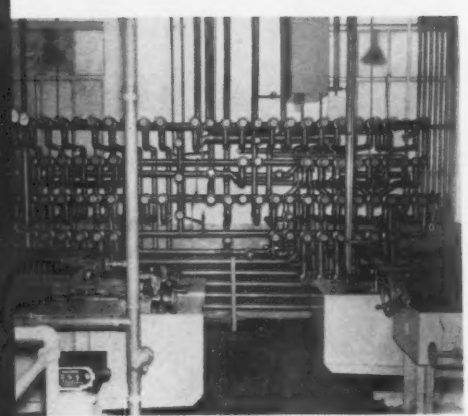


Mass distribution techniques applied to

INSULATING OIL HANDLING

BEN A. ISHAM, STORES SECTION SUPERVISOR, LOS ANGELES DEPARTMENT OF WATER & POWER





The L. A. Department of Water & Power's new Oil Depot is an integrated facility designed to take care of its insulating oil needs for at least the next 15 years.

The original facility, constructed in 1926 for the purpose of handling and storing all types of insulating oil, has been enlarged to 3,700 sq ft of floor space with a ramp for fork-lift trucks to the new 408-drum storage room.

The oil storage capacity has been increased from 50,000 gal to 134,000 gal with six new underground storage tanks, and two new sump tanks of 800 gal each increase the sump storage capacity to 2,660 gal.

Design Features

• Six new outdoor type, electric motor driven pumps and three new filters of larger capacity have been installed, while one old filter was retained to be used exclusively for cable oil. These filters are connected directly into the piping system.

• A new valve manifold with bypasses to eliminate mixing of different insulating oils was installed as well as a new piping system throughout the oil depot. Two additional pipe lines were added to the railroad spur to handle cable and scrap oils exclusively.

• New dispensing stations were installed on both sides of the oil depot for fast loading and unloading automotive tank trucks and trailers.

• Metering equipment with an accuracy of .1% was installed in the pipe lines and gages were added for the six underground storage tanks.

Electrical & Communications

• The electrical equipment was replaced in the filter room and now has three remote control stations in various locations of the oil depot.

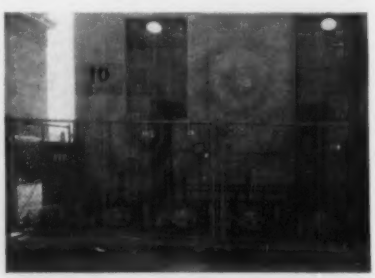
• The communication system to various dispensing and sump tanks throughout the yard now includes an intercommunication system with hand telephone sets, in addition to the annunciator signal system.

• The various oil handling operations, designed in accordance with the recommendations of the Los Angeles Fire Department, make this new depot rank with the best in the nation for safety and efficiency.

Change-Over

When construction began, all operations ceased so the construction work for the new additions could be installed without interruption.

Operational control and the handling of all insulating oil was diverted to other locations, which was made possible by the cooperation of the other sections who furnished temporary use of their insulating oil handling equipment.



Top: Dispensing stations handle every type of insulating oil either "in" or "out" to many sizes automotive tank trucks and trailers. Center: Tank gages record oil level, in inches, in each of six tanks

Lower left: There is a total of 112 valves in the system to control the oil flow

Right: Los Angeles Fire Prevention Bureau regulations required outdoor installation of electric motor driven horizontal pumps

At finale President Webster gathered entire NECA officers and staff for a tribute to their devotion to the association's affairs

NECA'S MANAGEMENT TREND

Never in its 59 years of annual conventions has the National Electrical Contractors Assn. seemed so seriously concerned with contracting as a business enterprise rather than a gamble as in its Oct. 23-27 national convention, ironically enough, in the gambling capital of America, Las Vegas, Nev. Certainly proof enough that gambling is not profitable was abundant during the recreation hours between daily sessions, for the approximately 5,000 men and women attending.

NECA's own management training programs and the market development program assisted by manufacturer and distributor partners, pointed the way toward selling their products and services rather than bidding for a job. The government spokesman gave little hope of legislating regulation of bidding. And labor's chief spokesman, on whom contractors in the past have depended for monopoly control of the market, told them new labor laws no longer permitted picketing, boycotts or strikes to bring them business. They must get out and sell it.

Appropriate, too, was the leadership of Harold A. Webster, NECA president, from Long Island City, who is likewise chairman of the National Electrical Week program for the entire industry.

The National Electrical Exposition in the adjacent exposition hall every afternoon was the biggest ever staged.

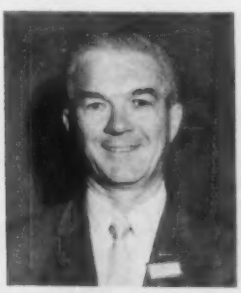
From the executive committee and governors meetings, aside from routine business of the association, came a change in policy. The income from its profitable "Qualified Contractor," instead of being earmarked totally for selling and promotion, may now be likewise used for other association activity. Strong divergence of opinion likewise developed over a study being made whether to include health and welfare on a national program in conjunction with its pension program with IBEW.

Major topic of interest on the first day to the larger contractor members and NECA staff, the preservation of the contract system in construction (with side issues of separate vs single contracts, fair bidding procedure, etc.), was the opening panel moderated by George B. Roscoe, NECA public relations director.

Giving an architect's view, as the second vice president, AIA, James M. Hunter of Boulder, Colo., after reviewing some of the "cloud 9" predictions of things to come, declared change must be accepted in everything except the enterprise system. To preserve it requires operat-

Norman Ferguson
District 9 vice president

Howard Bayley
District 6 vice president



Charles Berrell
District 8 vice president

ing with utmost fairness and ethics. However, he warned, to try to codify ethics rigidly only provides temptations for some to try to break the rules. He hoped a gentlemanly sense of fair play would be developed rather than written codes. Likewise, as to the recent implication that the architects seek to be master builders he assured them that their only ambition was to be captains of the design team and not general contractors.

Bidding Regulation

It was Leigh Barrett, chief of the Contract Support Division of Military Construction, U. S. Corps of Engineers, from Washington, who reminded the contractors bluntly what more government regulation of bidding would lead to. Agreeing that bidding practices were bad but not as to the best method to meet the situation he said the corps opposed direction in details by federal law. The federal agency should have no more control than to see to the faithful performance of contracts.

"Suppose you do get a listing law?" he asked. "How long before we will require that every sub and every sub-sub and every supplier be named in the original bid? Do you want that?" He went on to say that in every field where the government has been introduced into business it has widened and increased its control and its bureaucracy. Single contracts, he felt, would mean more waste, more trouble and claims that could not be settled for months or years. Unfavorable experience with separate contracts was recited in which costs of supervision were raised and architects required additional fees likewise.

"Are you asking us to build an empire of government employees, of supervisors on down eventually to the foreman level so complete that it will be easier to hire our own labor and do the work ourselves? Isn't that the horrible eventuality?" he asked.

The following talk by W. E. Ray, assistant manager, Purchasing Division, International Harvester Co., Chicago, was better liked. He said his company favored individual contracts, a policy that has been enforced for 25 years. The company practically is its own general contractor and makes separate contracts for all of the subtrades. It rigidly holds the bidding list to really qualified people and gives the supervision needed after coordinating carefully with subcontractor management on all details.

James D. Marshall, executive director, Associated General Contractors, Washington, D. C., urged better communication between subcontractors and generals for the solution of the bidding problem lest both lose the contract method of doing business to other forms of operation now threatening both.

"Sales—the first ingredient in profits" was the second day's theme. Appropriately it was Norman D. Ferguson, vice president of District 9, California Electric Works. San Diego, who ran this meeting. The meeting was addressed by F. E. Keith, chairman of the marketing committee of NECA, who told of NECA's plans for sales training. E. J. Thimme, general superintendent of distribution, New Jersey Public Service Electric & Gas Co., discussed his company's experience in contracting out the line construction and substation work of his company.

Sales Development

Industry spokesmen presenting programs of sales development especially designed for contractor participation then followed. B. H. Benning, general lamp and lighting sales manager of Graybar Electric, and G. H. Booth, lamp and specialty lighting sales manager, presented the Graybar contractor lighting sales program. George Taylor, past president of the Illuminating Engineering Society, likewise spoke of the effect of the Illuminating Engineering Society's research institute in creating a lighting market.

E. K. Handlan, sales manager, Emerson Electric Mfg. Co., St. Louis, outlined the profit possibilities in electric heating sales and offered the company's well-designed program for the development of this business. H. L. Cramer, Westinghouse Electric Corp., reviewed the business potential in the modernization of office buildings, industrial plants and institutional buildings, a follow-up of its "Power-up" program. R. L. Kempton, vice president, Edwards Co., outlined the possibilities of contractors selling a wide variety of electronic devices without getting into the more complicated part of the business.

The third session was devoted to finance and financial management of a contracting business with John A. Beck, vice president, District 2, in charge.

On a panel which recited the benefits they individually had obtained from the workshop on "Self Appraisal," Jack Mihalovich of Dahl-Beck Electric, San Francisco, was a panelist. He testified to the value of the workshop in reappraisal of the administration of the business and the realignment of responsibilities.

The Banker and the Contractor

A clincher was put on this session by a strong and realistic talk by Robert L. Gordon, vice president, Bank of America, Los Angeles. He told what the relationship between a banker and a contractor should be and how the contractor should develop that relationship on a basis of complete understanding and facts. "Some think that they can get by with hip pocket accounting but contracting needs more than that," he said. "If there was ever a businessman that needs good accounting and forecasting and budgeting it is the contractor." He advised keeping both the banker and the bonding company continuously informed with job status reports and to arrange for loans or credit even before bidding. "Usually where the situation looks sour to a banker it is apt to be sour to the contractor," he warned.

Another panel discussed the NECA Manual of Labor Units. On this Ralph Ecker of Empire Electric Co., Pasco, testified to the value of the labor units in working on government contracts. They are especially valuable when labor costs are being analyzed by the engineer and serve the same value as a Biddle book on material costs. The Army Engineers have even asked that NECA develop labor units on other functions and operations not now included in the manual.

Better Communications

Another Westerner, Dr. Robert A. Goodell, University of Southern California, followed the panel discussion. His advice was on the delegation of responsibility to a staff and the development of better communications between the manager and his organization.

Last day was devoted to production which was chiefly a matter of labor relations. NECA's labor relations activity was reviewed by James E. Swann, director, and addresses were given on safety measures by Milton I. Minto of MacNutt Electric Co., New York; C. J. Haggerty, president of the Building Trades Department, AFL-CIO, and formerly of the California State Building Trades. Haggerty talked of the recent difficulty as to jurisdiction of

work in the construction of the missile bases.

Gordon M. Freeman, international president of IBEW, was the final speaker. After outlining the terrific future in electrical construction volume, he cited figures as to the amount of the present volume being done by NECA contractors with IBEW electrical workers and advocated further inquiry to see how much of this work is going to others.

Labor Legislation

He cited the labor legislation of recent years and declared, "In many cases, the union's hands are tightly tied. Laws restricting strikes and picketing hamper us on the one side and our no raiding pacts within the AFL-CIO make it impossible for us to take work away from another union once it has been assigned. We want the jurisdiction, we want the wages, just as you want the jurisdiction and the profits, but we can't strike jobs, and so the time has passed — and this may be offensive language to some — when the contractors can sit back and wait for the union to get and keep work for them. Under present-day laws once the work has been assigned — and this is done back in the architect's blueprints — it is almost impossible to get that work away from somebody else."

He then urged contractors to see that specifications were written to include the electrical work in the electrical contracts and cited particularly luminous ceilings, electric heating, motors and controls, electronic systems, raceway substitutes, etc., as fields which may slip away from electrical contractors and the IBEW. He promised that the union would aid in every way especially in improving and expanding the skills of electricians to make them available for jobs the salesmen get.

Hawaii to District 9

After the resolutions Paul Briggs of District 6, Spokane, introduced a humorous resolution relinquishing the new state of Hawaii, which at the last convention had been assigned to District 6, to the California-Nevada District 9. New vice presidents for the Western districts elected at the board of governors meeting were Howard Bayley, Industrial Electric, Seattle, for District 6, succeeding W. R. Grasle of Portland; and Charles Berrell of the Howard P. Foley Co., Salt Lake City, for District 8.

Kendall Rehwaldt, region vice president, and Clarence Kluttz, program chairman

NAED PARTNERS SPEAK

The Partners in Business—electrical, that is—got together in great numbers at Las Vegas, Nev., for two successive weeks of conventions. It was the National Association of Electrical Distributors, Western Region, Oct. 18-20, which identified the partners. They were: the manufacturers whose wares they distribute as a second partner, and the contractors or industrials, their customers. The other two partners held the second week's convention, NECA, Oct. 23-27—and the manufacturers displayed their wares at the contractors' National Electrical Exposition, Oct. 24-26, at the Las Vegas new Convention Center and Exhibit Hall.

Each partner had his day at the NAED, Western Region, 52nd annual convention held at the Stardust. Regional Vice President Kendall P. Rehwaldt, General Electric Supply, Los Angeles, and his program chairman, Clarence R. Kluttz, California Wholesale Electric, Los Angeles, dramatized the convention opening with these "partners." Rehwaldt first called up A. H. Gudie, Biddle Trade Publishing Co., to represent the manufacturer, NAED president, J. A. Meier, Florida Electric Supply, Tampa, the distributor, and Joe Felber, NECA exposition manager, the customer.

In Western garb, they were then personified to the rest of the convention by similarly garbed window display figures in a niche at one side over a banner with the theme, "Partners in Business."

The three regional board of governors members, George B. Smith, Coast Wholesale Electric of Burbank; Earl E. Morton, Westinghouse Electric Supply, San Francisco; and John P. Lawton, Graybar Electric, Seattle, took turns presiding at the three-day meetings.

Each of the partners told the others quite frankly the things they should do to improve their respective and joint business relations.

Speaking for manufacturers, Robert J. Sloan, president, Crouse-Hinds Co., said besides the customary distribution functions manufacturers

Joe Felber, Bill Gudie and Jim Meier personified customer, manufacturer, distributor

Distributor day speakers—Art Hooper, NAED; Henry Jones, Valley Electric; B. H. Boatner, Westinghouse Supply; J. A. Meier, NAED president; and Earl Morton, WESCO, chairman

ask for support of political action that affects the entire industry, support of law in strike situations, support of profits in all segments of the industry and reports to manufacturers of changing trends and market conditions, methods, etc., in their areas.

David E. Allen, executive vice president, Anaconda Wire & Cable, laid stress on two dominant factors oppressing the industry today. First were the growing use-demands and specification changes in wire products demanded by the defense program. The other was the competitive and unrealistic price situation. His company was cutting costs by increased production, restudy of field service and reduction of distributor outlets to about 75% of the former number.

Donald D. Scarff, once on the Pacific Coast and now general manager, Large Lamp Department, General Electric, Cleveland, used a clever coordination of slides, moving pictures and talks to illustrate that, from a customer's standpoint, distributor service ranks first, reputation for quality second before price in consideration.

Leonard P. Shelley, vice president, Federal Pacific Electric Co., Santa Clara, included the government and labor among the partners of any corporation today. That distributors do not often enough talk over their business and financial problems with their manufacturers, he claimed. Manufacturers would recommend programs of cost reduction, better procurement methods and selective securements. Of selective securement, he pointed out that not all product lines are profitable nor are all customers profitable. Distributors as well as manufacturers should develop more selectivity.

Distributors' Day began appropriately with the address of National President Jim Meier. To make the partnership work, he said, would take facts, vision and guts. For facts the distributor could find a rich source in the NAED and its committee work and reports. Through it a reappraisal could be made of the manufacturer and distributor relationship. "We must cease running a sparring match instead of working with enlightened teamwork," he said. Vision was needed for planning ahead together. Both have experimented with sometimes unsound methods and should come back to fundamentals. As manufacturers present new materials and equipment, distributors must be alert and flexible to distribute these courageously, he concluded.

Speaking on the morality of profits, Bolan H. Boatner, president, Westinghouse Electric Supply Co., asked if businessmen were under the impression that making a profit is immoral. Yet successful and profitable companies are the ones who do most for their employees, the customers and the country. As a warning he said that distributors must get out of the banking business or the bankers will be in the distribution business.

He proposed a four-point profit program. It should consist of (1) a definite plan of action for raising the profit level, (2) clear understanding among employees, what is expected of them and with manufacturers what the profit objectives are, (3) be mindful that this is not a static industry and change is inevitable and (4) be sure it is managed with a firm hand.

The partnership that NAED provides a member was eloquently described by Henry E. Jones, president, Valley Electric Co. of Sacramento, as a new member. "Why should I need the NAED when for the past 15 years I have run my business without it?" he asked and then gave full explanations of three major reasons. 1. NAED will help us improve our knowledge and efficiency and, hence, our profit position. 2. We will add our voice to those of the industry and have our say in industry matters. 3. We owe to the industry something of what we have learned about it and should pay back to the industry for some of that which we have taken from it.

Even partners have problems but that by analyzing them a way to solve them can be found was the essence of the talk by Stanley M. Johns, vice president, The Electric Corp. of California, Los Angeles. He told what the southern California and Arizona NAED members had been trying to accomplish in this line in a series of workshops moderated by Dr. E. M. Gherman, management consultant, formerly of Incandescent Supply.

One Problem at a Time

These clinics confined themselves to one problem at a time such as credit policies and practices, selling policies and practices, wages, deliveries, returned materials, etc. Of interest to the manufacturers he described one on "Selling Practices of Our Suppliers" which boiled the problem into two parts (1) what are suppliers doing with our customers that we'd like to have them do differently? (2) What are they doing to distributors that we would like changed? Johns listed the questions which resulted from these meetings to analyze the problem. Then he asked the manufacturers

to have the courage to accept the challenge to tell distributors as frankly their analysis of their problems with them.

The strong voice of Arthur W. Hooper, executive director of NAED, summed up the Distributor Day, asking the final question, "What kind of a partner are you?" This was addressed each to the distributors and their suppliers. The problems of distribution exist because "we're mixing up our economics, our particular company ambitions, our pride and a few other things and winding up with a number of stumbling blocks," he declared. There were too many "square solutions at one level that cannot fit the round hole at another." Because distribution is such a vital need to the economy, he declared that methods and hunches must give way to well designed distribution based on market analysis, training in selling and in management—a real working partnership approach. He described the training courses and management institutes NAED has prepared and is working to further so that wholesale distribution will no longer simply be a business "we play by ear." Concluding, he said, "We are converting a partnership based on expediency to a partnership of mutual trust, understanding and dedicated to better service."

Customers' Day was opened by George Roscoe, director of public relations, National Electrical Contractors Assn., who declared that contractors who, 15 years ago, turned down all efforts to launch a national sales promotion program are now becoming aware of the need. Now they have a program to develop a pool of skilled salesmen which should have the support of the salesmen of the distributor and manufacturer and not their competition. Although contractors have enjoyed a 15-year boom which has raised labor costs and materials costs, yet more construction work is being done under engineers' estimates than over them.

He spoke of NECA's efforts to have legislation passed, stopping bid shopping and bid peddling on government contracts and then discussed procedures for registering and handling of subbids that are being inaugurated in several areas, particularly Los Angeles. With contractors relieved of the pressure of bid shopping, they should be less inclined to shop themselves among the suppliers, he contended.

Deviating at first to describe foreign trade conditions and foreign competition for American products, George W. Rugg, manager of purchases, Bechtel Corp., went on to declare that from a purchasing agent's standpoint a lot of the prices today submitted to him are not solicited. "I can fold my arms and sit there and prices keep changing and coming in and being offered. I would be silly not to take advantage of these prices," he declared. He declared the general contractor does not gain by this situation yet is in a tight competitive market and must take advantage of all the breaks.

As far as products, he said most everyone has equivalent products and all at about the same price so that service is really the only thing they have to sell. He then stressed the importance of good service and delivery on schedule which in the end would tend to reduce the user's cost of doing business.

Dealer survival in the '60s was eloquently described by Laurence Wray, editor, *Electrical Merchandising Week*. He said that yesterdays count for nothing. It is the climate for business ahead that dealers must look to. Evolution in retailing has had shattering impacts recently. The retailer must decide whether he will be operating in an expanding or contracting market, where his market is moving as far as competition is concerned and what it means to him. He cited discount house, mail order, variety store, contractor-builder and even food supermarket influences on retailing. Just as hundreds of manufacturers of appliances gave way to a remaining few, so it may be with dealers.

"Today no one owns a customer," he declared. Trade patterns of the past are being discarded by the youngsters. Fabulous new products are forthcoming. The growth and importance of service of appliances was mentioned. The dealer, he said, was one of the forgotten partners in the distribution business.

Concluding the Customers' Day, Roy Vernstrom, vice president, Pacific Power & Light, substituted for Robert Gros, PG and E. He showed how another partner, the utility, is doing an advance selling job "for the long haul" in research work along lines which will mean eventual growth of electrical business and new products that the other partners can make, distribute and sell. He cited specifically his own company's researches in geology and mining, fish biology, sand dune reservoir water supply, mine site steam generation and a 1,000-mile ultra-high voltage transmission line.

The convention closed with an inspiring address at the luncheon banquet presided over by Ralph W. Rohrback, past vice president, Pacific Wholesale Electric Co., San Diego. Dr. Dale E. Turner, University Congregational Church, Seattle, his theme, "The second mile," emphasized the desirability of doing more than was expected, of giving more service, better quality; that it was only those who did so who rose above mediocrity.

Two afternoon workshops were provided for those who did not play golf or the slot machines. Both were well attended. Dr. Gherman conducted one of his incisive workshops into the problems of problem solving. The essence of the method is to confine the talk to absolute provable facts, eliminating all inferences and opinions. Then from the facts developing a program of action and monitoring the program to see that it is accomplished.

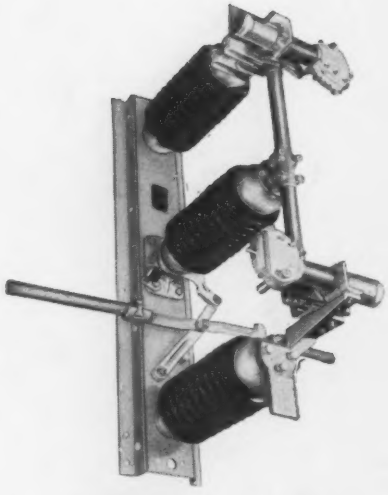
The second workshop was on distributor and contractor training programs and was presided over by John Taylor, Incandescent Supply, San Francisco.

At the election of officers, Ken Rehwaldt was re-elected to continue as regional vice president until NAED's next annual convention, according to new bylaws. Election of vice presidents will take place then. A new post of zone chairman formerly combined with that of regional vice president was given to Stanley M. Johns of Los Angeles. Board of governor members elected for the Pacific Northwest was James Love of Love Electric Supply, Tacoma; for intermountain region Joe Wright, Afton-Lamp Electric of Boise; the northern California area Earl Morton, Westinghouse Electric Supply; southern California George B. Smith, Coast Wholesale, Burbank; and for a proposed new governor for Hawaii Dan Flinn II, American Factors. Area chairman elected for Washington was Elmer Favro, General Electric Supply, Seattle; vice chairman for Spokane Maage La Counte, Columbia Electric, Spokane, for Oregon Robert E. Lange, Eoff Electric, Portland, for Montana-Idaho Milton Hooper of Graybar, Butte, for Utah Frank Young, Westinghouse Electric Supply, Salt Lake City, for southern California Stanley Johns, Electric Corp., and northern California John Taylor, Incandescent Supply.

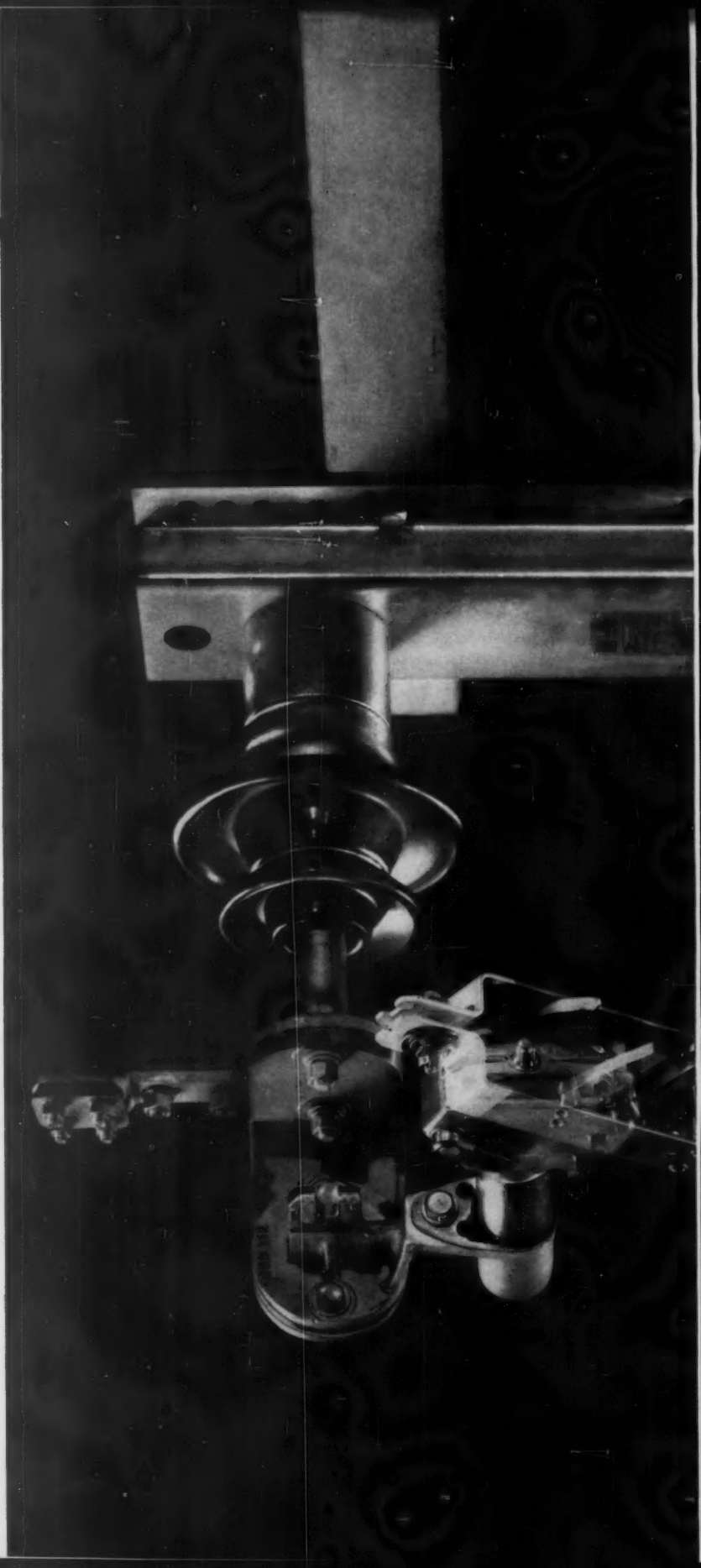
NAED's next annual convention will be at the Jack Tar Hotel, San Francisco, in mid-September 1961, it was announced.

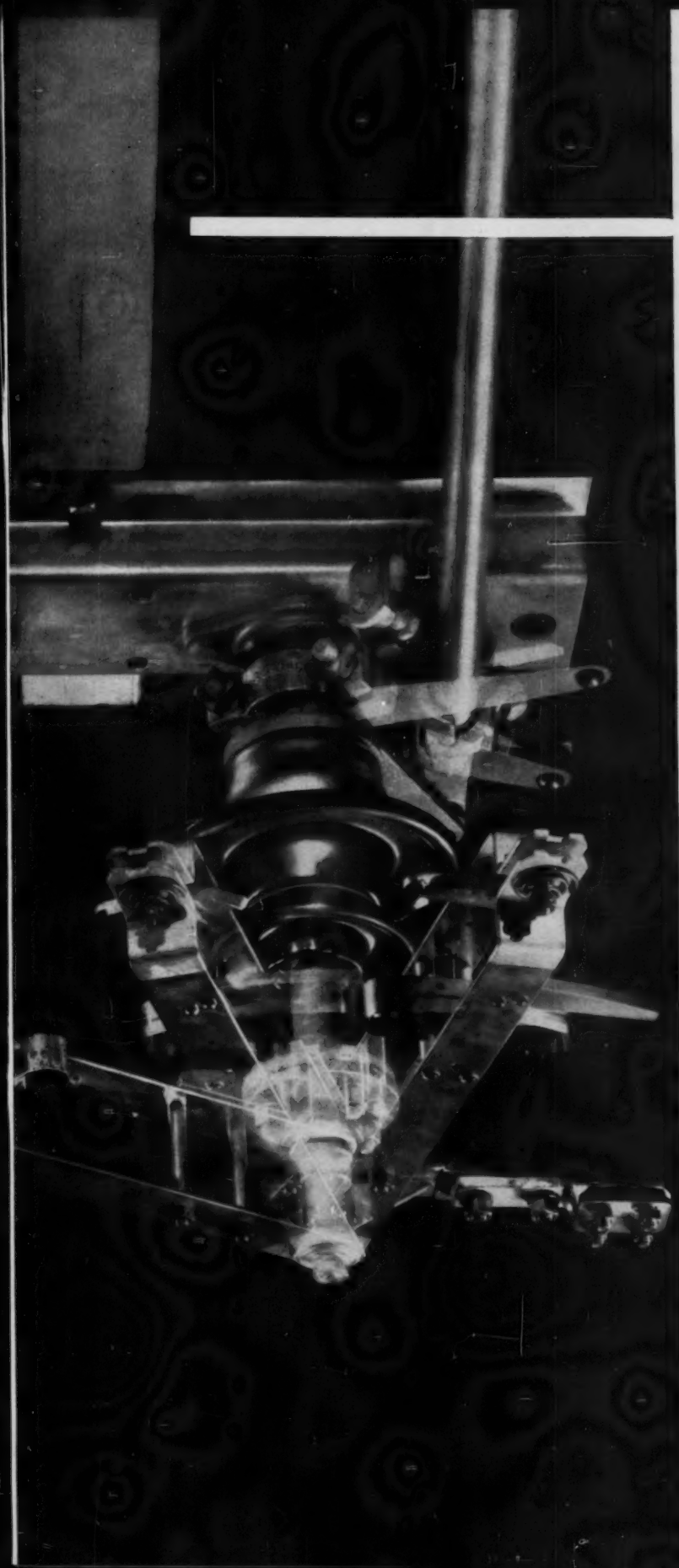
SPLIT THE LOAD

(OR EVEN DUMP IT)



Double-Break Style, 34.5 kv rating (above) and Side-Break Style, 14.4 kv rating (right)





with S&C Load Interrupters that cost no more than disconnects

Now from S&C you can get load interrupters at the same price as disconnects. This means that you can handle any kind of line switching in the simplest way at the lowest possible cost.

Here are the devices that do it:

1. The Side-Break Alduti Load Interrupter at 7.2 kv and 14.4 kv, and

2. The Double-Break Alduti Load Interrupter at 23 kv and 34.5 kv.

Both give you load dumping* (full 600-ampere arc-free load switching at full line voltage) along with loop sectionalizing (switching currents in parallel or loop circuits) and line dropping (switching line charging currents).

Since these switching duties at today's voltages and loads can't be handled by disconnects, why not compare the cost of S&C Load Interrupters with disconnects. You'll find there's no premium price for premium performance.

Here are some of the other advantages of S&C Load Interrupters:

- 600-amp load switching without line or feeder breaker openings
- a maintenance-free interrupting device
- no external arc
- can be mounted in any position . . . vertical, upright or inverted.

For more information, please contact S&C Electric Company, 4425 Ravenswood Avenue, Chicago 40, Ill.

* Important because: (1) Emergency situations (wires down, etc.) demand quick action, hence dumping the load. There is no time to set up communications for complicated breaker and switch sequencing. And (2) there's always the possibility of an operator error or misunderstanding, with the result that a loaded circuit may be dumped inadvertently.

S&C ELECTRIC COMPANY

S&C

People

PP&L Realigns Administrative Personnel

Albert Bauer, formerly assistant chief engineer and manager of construction and operations for Pacific Power & Light Co., has been named general manager of systemwide district service operations in a realignment of administrative personnel on a division organization. The new setup, announced by President D. R. McClung, makes Harold H. Henninger assistant general manager and promotes four supervisory executives to division managers.

Bauer

The division managers are: Oregon outside metropolitan Portland, Homer Beale, former assistant general manager for Walla Walla, Wash., Idaho and Montana; Washington, D. B. Leonard, assistant general manager at Yakima, Wash.; Idaho and Montana, Robert R. Gordon, district manager at Kalispell, Mont.; Portland, Roy Vernstrom, assistant general manager at Portland; Wyoming, Veryl N. Hoover, continuing as manager.

At the same time McClung reported plans of Vernstrom to leave the company in the near future and the appointment of Orren W. Brownson, assistant vice president in charge of the rate department, to succeed him.

► **Joseph L. Williams,** superintendent of electrical maintenance construction for Portland General Electric Co., has been promoted to general division manager of the company's divisions outside Portland. **Nile Burman,** previously coordinating electrical engineer for the company, replaces Williams as superintendent of EM&C. Williams has been with the company since 1948 and Burman since 1935.

► Two Westerners were appointed recently as Fellows of the American Institute of Electrical Engineers. They are **Clifford C. Diemond,** substation maintenance supervisor, Bonneville Power Administration at Portland, and **Louis N. Stone,** head of the electrical engineering department of Oregon State College, Corvallis. The former was cited for contributions to power system protection, the latter for contributions to undergraduate and graduate electrical engineering education and to research in the area of high-voltage phenomena.

► **Elmer Landin,** auditor for the Washington Public Power Supply System at Kennewick, Wash., has been named administrative assistant for the organization. He will fill the vacancy created by the resignation of **William Nordeen,** who has been named manager of Northern Lights, REA co-op at Sandpoint, Idaho. Landin will retain his auditor post.

► **William J. Carkeek** of Puget Sound Power & Light Co. was a finalist in the Westinghouse Power-Up Achievement Award. He is one of six who will receive bronze awards plus $100.

► The Interior Department announced that **James R. Granger** has been named construction engineer for the $190,300,000 Yellowtail project in eastern Montana. A USBR project, Yellowtail will include a 520-ft concrete arch dam, a reservoir with a capacity of 1,375,000 acre-ft and a 200,000-kw hydroelectric plant. It will be on the Big Horn River 45 miles southwest of Hardin, Mont.

► **W. L. Searce,** former office engineer for Harza Engineering Co. on the Priest Rapids Dam project, has been hired as a consultant by the Grant County Public Utility District, which is building the Priest Rapids and Wanapum dam projects on the Columbia River in eastern Washington.

► **P. J. Miller,** president of the board of directors of Clearwater Power Co., rural electric cooperative at Lewiston, Idaho, will retire Nov. 17 after serving in the post for 24 years. **Carrol Boggan** has been nominated to succeed him.

► **C. A. Miller,** general supervisor of linemen for Tacoma City Light, retired Nov. 1 after nearly 50 years of service with two power utilities. He began patrolling lines for the Idaho Power Co. at the age of 15, moved up to managership of the firm's office at Buhl, Idaho. He started with Tacoma City Light as a junior meterman in 1927.

Hanson Succeeds Thomas

Earl A. Hanson was elected a vice president of California-Pacific Utilities Co., effective Nov. 1. He succeeds Ralph R. Thomas, who has announced his retirement effective Dec. 31. In the utility business 50 years, Thomas went to Cedar City, Utah, in 1947 as vice president and general manager of the Southern Utah Power Co.

In addition to that assignment, Hanson will be manager of the company's Southern Utah Division with headquarters in Cedar City, Utah. With more than 25 years of utility engineering and operating experience, he had most recently been manager of the company's Lassen Division in northern California.

► **George A. Schreiber,** executive vice president of Public Service Co. of New Mexico, has been appointed to fill the unexpired term of the late **Ralph J. Wann** on the company's board of directors.

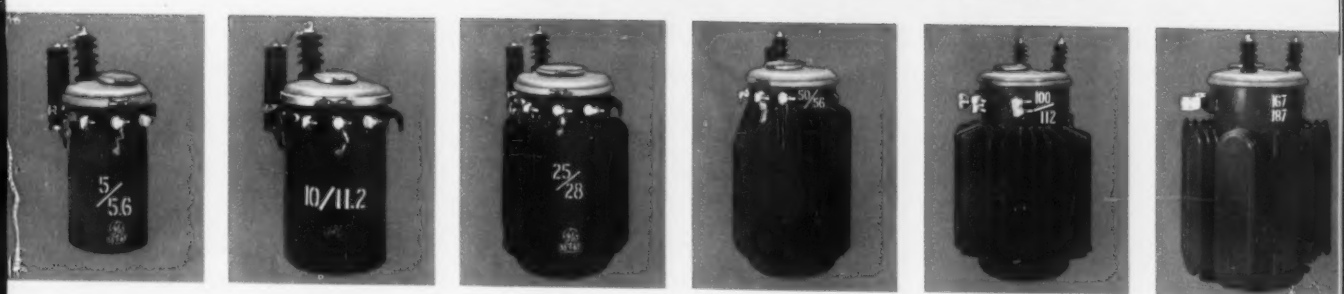
► **Walter A. Mackie** will become project engineer at Bonneville Dam in December, following retirement of **Albert M. Capps.** Mackie has been project engineer at Detroit Dam, Corps of Engineers project on the North Santiam River in Oregon, since 1952. Capps, retiring after 25 years government service, has been project engineer at Bonneville Dam since 1956. Mackie was a construction supervisor at J. D. Ross Dam, Skagit project of Seattle City Light, early in his career.

Mackie

► **Dr. Chauncey Starr,** vice president of North American Aviation and president of its Atomics International Division, had been made an Eminent Member of Eta Kappa Nu, national electrical engineering honor society.

► **William L. Ginkel** has been appointed operations division director of Atomic Energy Commission's Idaho office, effective Nov. 19. He had been assistant director of the operations division since 1956 and his promotion fills a vacancy created by resignation of **J. Bion Philipson.**

GENERAL ELECTRIC LOWERS DISTRIBUTION TRANSFORMER OWNING COSTS WITH PREFERRED KVA RATINGS



GENERAL ELECTRIC

PREFERRED-KVA RATINGS OFFER . . .

5 ways to lower distribution transformer owning costs

Another significant step toward lower distribution transformer investment and operating costs

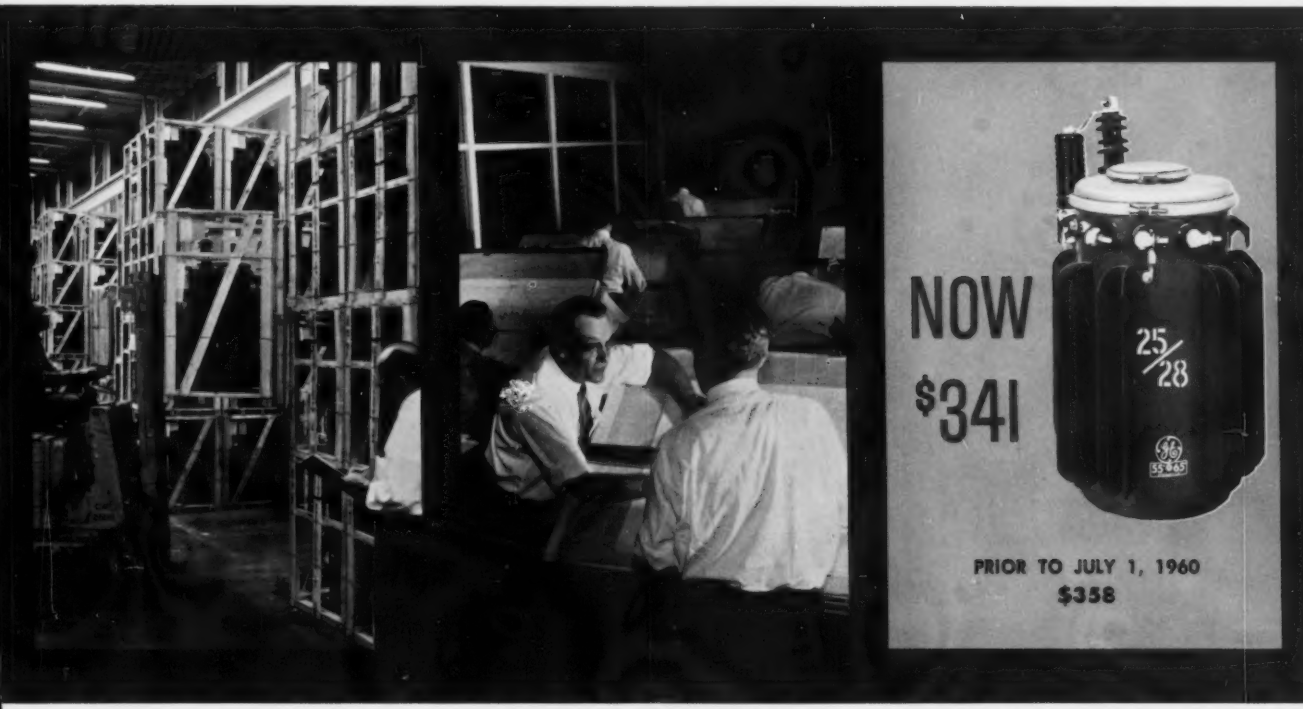
Lower Changeout Cost Use of preferred-kva ratings can lower changeout costs since more load growth can be absorbed. Based on a changeout practice of 150 percent of rating and an annual load growth of six percent, transformer replacement occurs on the average of every 7½ years. With preferred kva ratings, changeout would occur every 12 years, extending the transformer life-on-the-pole 4½ years.

Lower Operating Costs Distribution system operating costs can be lowered by using standard preferred-kva ratings. When preferred-kva ratings are used, the average transformer load is less, lowering total losses. Lower copper losses more than compensate for increased core losses. Also since voltage regulation is related to copper loss, use of General Electric's preferred-kva ratings also means better voltage regulation.

General Electric's preferred-kva distribution transformer program offers you five important ways to lower your total owning costs of distribution transformers. The preferred-kva concept is based on an extensive survey made among representative utilities across the country. The majority of those interviewed preferred standardizing on these **55° ● 65°** transformer ratings: 5/5.6, 10/11.2, 25/28, 50/56, 100/112, and 167/187 kva.

By standardizing on these preferred-kva transformer ratings from General Electric, you can own the highest quality transformers at lower total owning cost than ever before possible.

Before you buy another transformer, let your G.E. Sales Engineer show you how you can lower your distribution transformer owning costs with preferred-kva ratings from General Electric.



Lower Inventory Cost You can reduce your transformer inventory costs by standardizing on preferred-kva ratings. For example, if present maximum stock requirements are 20 15-kva units and 35 25-kva units, a total stock of 55 transformers is required. Standardizing solely on the 25-kva rating, total stock could be lowered to 44 units because of the diversity of need.

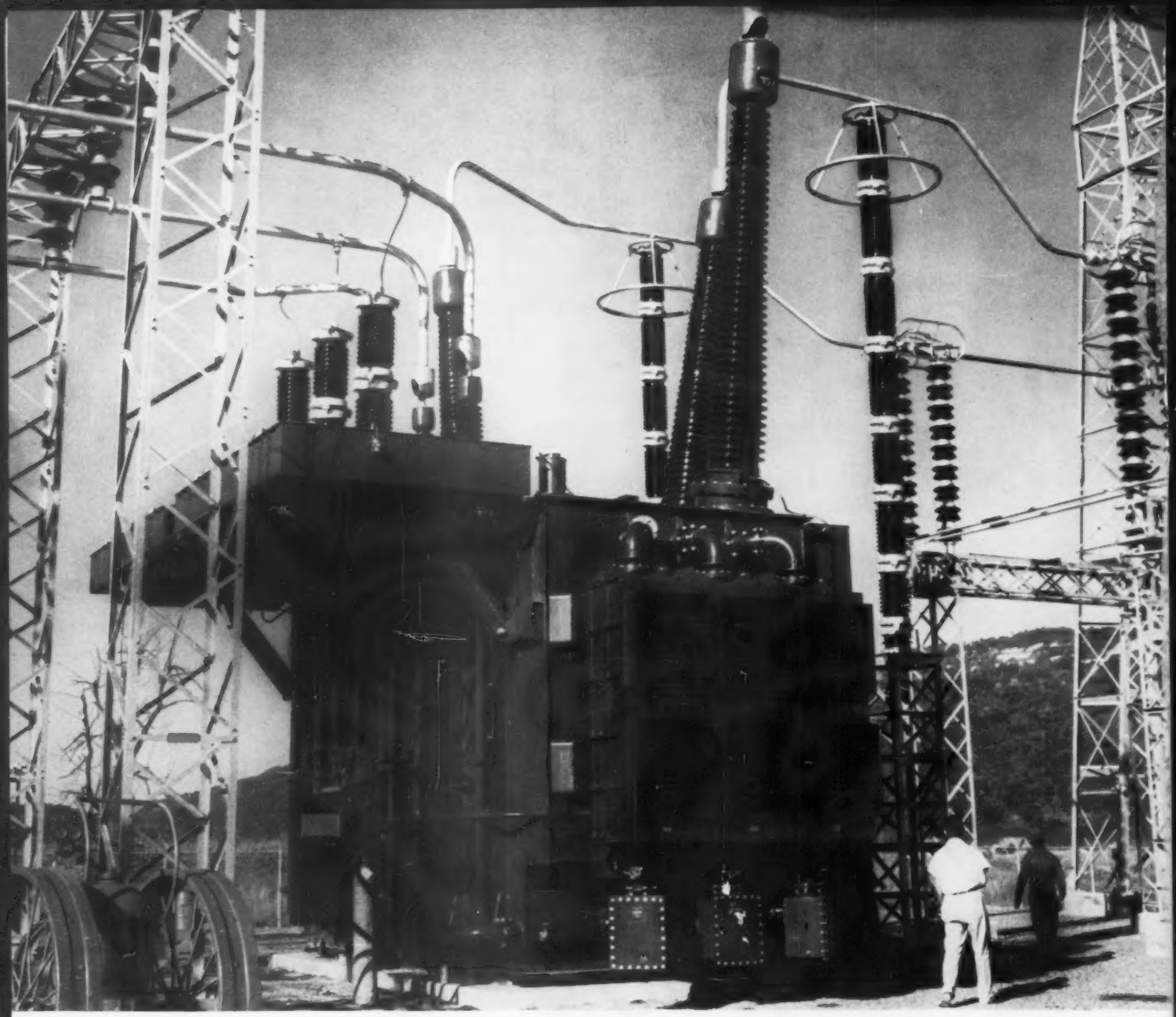
Simplified Procedures Standardizing on preferred-kva distribution transformer ratings lowers the cost of such overhead items as ordering, record keeping and financial procedures. Simplifying these procedures plus simplification of transformer application methods helps lower your total owning cost of General Electric distribution transformers even further.

Lower Initial Price In addition to the other factors which contribute to lower distribution transformer owning costs, General Electric recently lowered the initial price of preferred-kva transformers as much as five percent.

This action was taken to reflect manufacturing cost savings which result when utilities support this program by volume purchases of fewer kva ratings.

Progress Is Our Most Important Product

GENERAL ELECTRIC



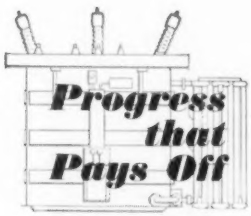
FIRST OF ITS KIND – YET OF NORMAL DESIGN

This EHV unit, at the Claysburg Station of Pennsylvania Electric Company, is the highest-voltage three-phase power transformer in utility service in America. First of its kind, it is rated at 460/115 kv, 60,000 kva output, designed and tested at 1425 kv BIL.

Design and appearance are like that of other General Electric power transformers. This unit conforms to current utility preference for low-cost, three-phase construction. It essentially extends G-E's line of PD power transformers of customer-preferred design.

When you are ready to go to EHV, you can count on the economy and reliability of General Electric power transformers.

421-61



POWER TRANSFORMER DEPARTMENT

GENERAL ELECTRIC

PITTSFIELD, MASS.

CONTRACTING & CONSTRUCTION SECTION

STATISTICS / COSTS / PROPOSED PROJECTS / NEW PRODUCTS / NEWS

LATE NEWS FLASHES

Creeping Inflation in Building

Building costs in the 11 Western states have increased an average of 1% this year and it now takes $2.68 to buy and assemble the materials that $1 did in 1941, according to F. W. Dodge Corp. service. In another analysis made by the Housing Division of the U. S. Department of Labor, a declaration was made that it is no longer possible to build a home for a small family under $10,000.

Four-Hour Bid Plan Readied

Plans to officially launch the four-hour bid moratorium plan to control bid peddling in southern California are developing and the program may start at the first of the year. On the general committee Stanley R. Brekhus, president, Los Angeles Chapter, National Electrical Contractors Assn., is secretary. D. L. Jackson is alternate member on the executive committee.

Flush Meters Are Out

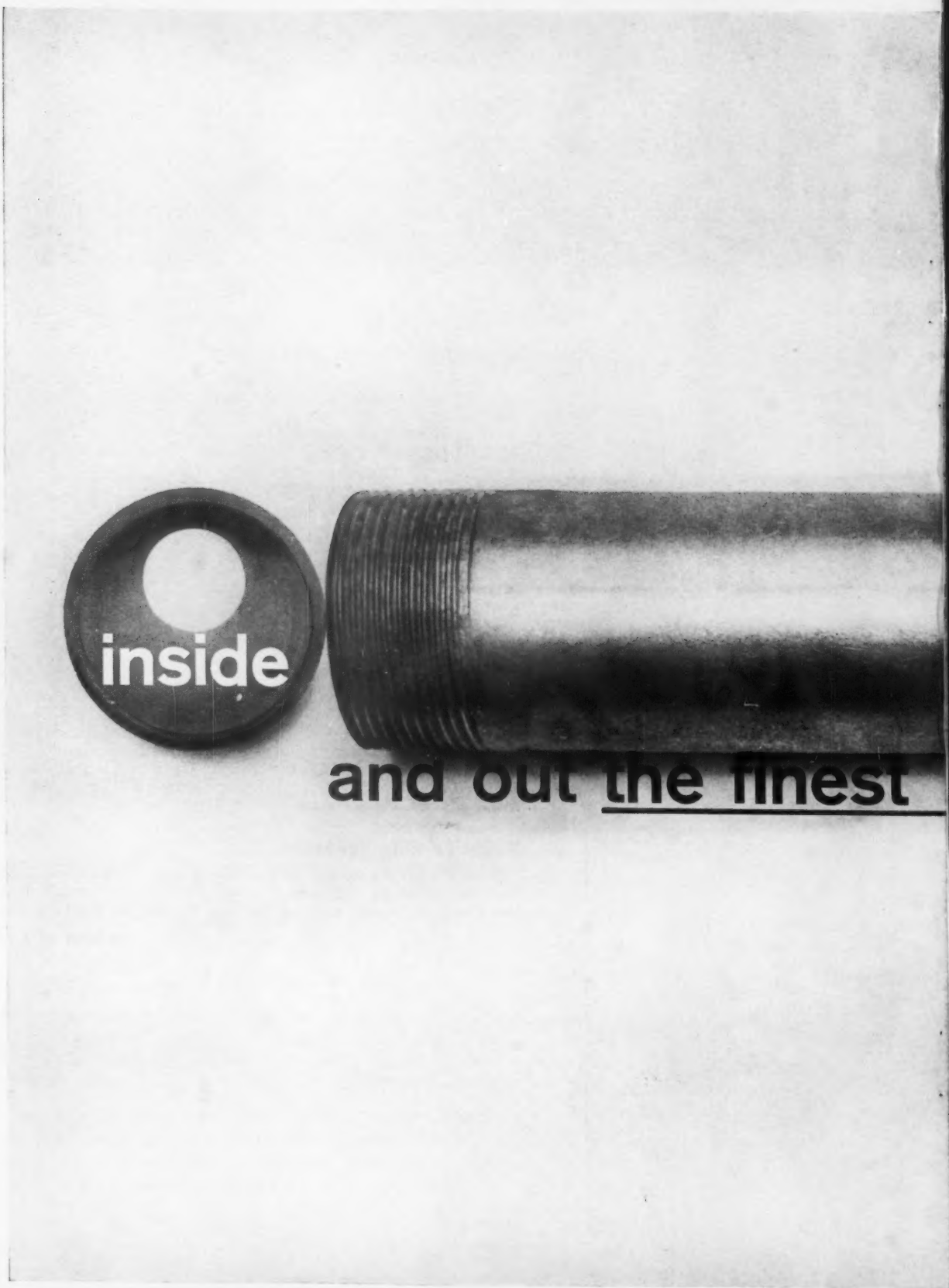
Fully flushed-in meter sockets can no longer be fabricated, distributed or installed in the area served by the Los Angeles Department of Water & Power after Dec. 1, 1960, except in cases where wiring permits are dated prior to that. This is in conformity with a recent notice issued by the Pacific Utilities Electric Service Requirements Coordinating Committee on Sept. 1 and probably will apply in other areas too.

Picket Fencing Renewed

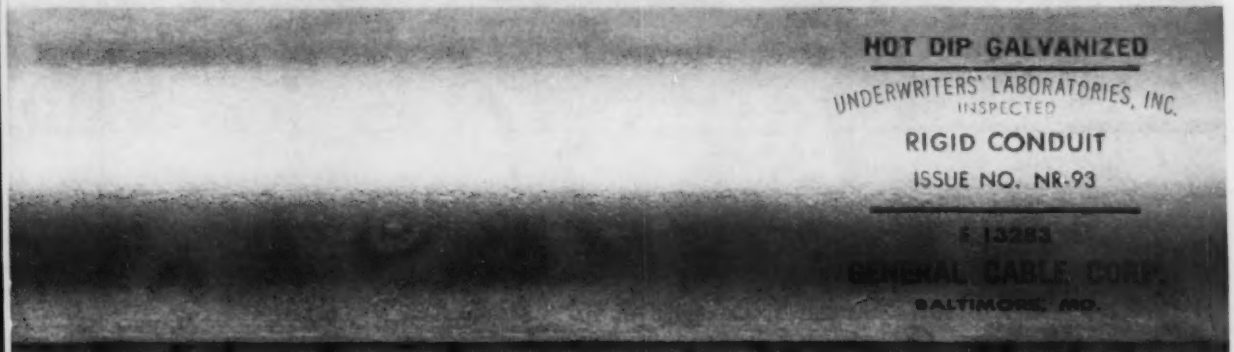
Next Congress is bound to have a big fight on its hands over the Situs picketing bill, which never got through committee at last Congress despite a strong backing by Senator Kennedy and

Continued on p 76

Page 88 NEW PRODUCTS
102 ESTIMATOR'S GUIDE
103 PROPOSED WESTERN PROJECTS
98 READER SERVICE SECTION


inside
and out the finest

conduit: top quality steel, hot-dipped galvanized inside and out, guarantees a uniform protective zinc covering and ensures a super smooth inner surface for fast wire pulling. **threads:** no mechanical wiping of threads after dipping for full zinc protection; threads are protected from damage during storage or shipping by a removable plastic thread protector. **conduit and threads:** chromated to give excellent protection against white rust.



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730 Third Ave., N.Y. 17, N.Y.

GCC
GENERAL CABLE CORPORATION

For phone number of closest representative see advertising index in back of book.

LATE NEWS FLASHES

Continued from p 73

the labor organizations. Both U. S. Chamber of Commerce and Associated General Contractors as well as a number of manufacturer groups were all against it. Among the building trades only NECA committed itself for it officially.

Don't Go Near the Water

Beverly Hills has issued a new swimming pool construction warning. It will not allow any swimming pool under conductors of a service to a building or near any electric distribution system. If pool lights are used for other electrical equipment, all supporting rings and metal are to be bonded to the grounding system.

In Burbank, Calif., the code has been amended to require that no wires be installed directly above or within 18 ft radially from the edge of any pool and that the voltage for under-water lights be limited to 12 v from an isolating transformer located at least 10 ft from the water's edge.

► **Rocky Mountain Chapter, NECA,** has just appointed William J. Birkett as a new territory manager for the association in the Wyoming area. He will make his office in Casper to relieve John Hecht, Rocky Mountain Chapter manager, for the increased load of responsibility in the Denver area.

Antitrust Panel Planned

An antitrust panel is scheduled as a feature of the tri-district meeting of NECA chapters to be held at the Fairmont Hotel, San Francisco, April 26-29, 1961. Invited to speak are Wallace Howland, chief antitrust attorney for the State of California; Lyle Jones, chief antitrust attorney for U. S. Department of Justice in San Francisco regional office; and Ed Pewett, NECA chief antitrust attorney. District meetings are scheduled for the afternoon of Wednesday, April 26, and the morning of Thursday, the 27th, with general meetings on Thursday afternoon, all day Friday and Saturday morning. The banquet will be held in conjunction with the annual dinner honoring its officers by the San Francisco Chapter.

► **A uniform wiring code** for southern California, the work of many months of a committee from inspectors and others in southern California, has been prepared and copies were distributed at the July 20 meeting of the IAEI Southern California Chapter. Southern California Edison Co. helped to print and bind 500 copies.

Men and Places

Officers and dates for 1961 were selected at the Nov. 9 meeting of the Southern California Chapter, IAEI. A. W. Pollock, chief electrical inspector, Santa Monica, is chairman; James E. Bradsberry, county building inspector, Santa Barbara, vice chairman; Charles D. Metzger, chief electrical inspector, Long Beach, secretary-treasurer; and on the executive committee are G. A. Wintz, Barney Alverson, W. P. Shigley, Martin Luskin and Ray Gunning. Meeting dates and places were announced as follows: Pasadena, Jan. 25; San Diego, March 22; Bakersfield, May 24, a joint meeting with Central California Chapter; Riverside, July 26; and Glendale, Nov. 8.

Speaker Circuit Works

Regional activities conference of South Pacific Coast Region, Illuminating Engineering Society, will be held at the Mark Thomas Inn, Monterey, Jan. 27, according to Roy Kreyser, regional vice chairman. One of the projects initiated at the last such conference, the arranging of a circuit of meetings among the various chapters and sections, so that prominent speakers could go from one to the other in a series, has been working very well. The first such series was one covered by Joseph A. Schneller of Jefferson Electric Co. on fluorescent ballasts. J. S. Hamel, consulting electrical engineer, Burbank, was a second featured speaker with "Some Interesting Impressions of Lighting in Europe." The next such tour will be made by Charles D. Gibson, chief of the Bureau of School Planning, Department of Education, Sacramento, who will make a series of meetings in January. Willard Allphin, director of illuminating research, Sylvania Electric Products, will cover the circuit in February. Chares L. Amick, Day-Brite Lighting, St. Louis, is scheduled for next September. C. W. Macy, San Francisco, is the regional program chairman, coordinating the programs.

Here are the Graybar Offices in the West

ARIZONA

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Tucson:	212 South Park Ave. MAin 2-6439

CALIFORNIA

Bakersfield:	2828 "K" St. FAirview 4-4755
Fresno:	2626 Hamilton Ave. ADams 7-4175
Long Beach:	800 West 16th St. HEmlock 2-2911
Los Angeles:	210 Anderson St. ANgelus 3-7282
Oakland:	1911 Union St. GLencourt 1-5451
Oceanside:	805 N. Tremont St. SAratoga 2-2141
Sacramento:	1900 - 14th St. HIckory 4-8830
San Bernardino:	655 South "H" St. TUrner 9-1051
San Diego:	720 State St. BElmont 3-1361
San Jose:	1376 N. Tenth St. CYpress 2-9090
San Francisco:	1750 Alameda St. MArket 1-5131
Santa Ana:	301 French St. KImberly 3-8309
Santa Barbara:	329 S. Salinas St. WOodland 5-1013
Van Nuys:	15520 Cabrito Road STate 2-9600

COLORADO

Colorado Springs:	630 West Vermijo Ave. MElrose 4-3701
Denver:	104 Wazee Market TAbor 5-7111

IDAHO

Boise:	1325 Idaho St. BOise 3-2594

MONTANA

Butte:	604 E. Aluminum St. BUtte 3233

OREGON

Eugene:	2380 West Broadway DIamond 4-2224
Portland:	N.E. 60th and Banfield ATlantic 8-5661

UTAH

Salt Lake City:	336 North Third West St. ELgin 9-8771

WASHINGTON

Seattle:	King & Occidental Sts. MUtual 2-0123
Spokane:	West 1033 Gardner Ave. FAirfax 7-6611
Tacoma:	2112 "A" St. MArket 7-0164

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Graybar, a working "partner" of utilities for years, knows utility tools and tool problems. But, whatever the problem, whether a special order, special product information, regular scheduling or emergency shipments of materials, equipment and tools, Graybar is geared to provide the Utilities with *special* assistance.

978

When Graybar is your auxiliary warehouse—

You save on storeroom costs
Reduce inventory investment
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Step up manhour efficiency
Simplify bookkeeping

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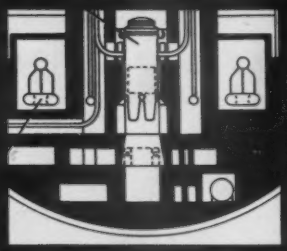
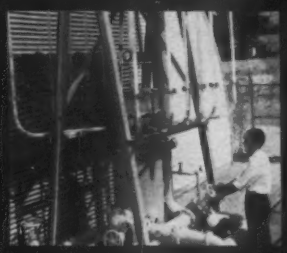
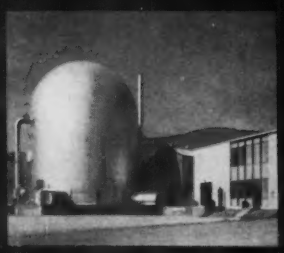
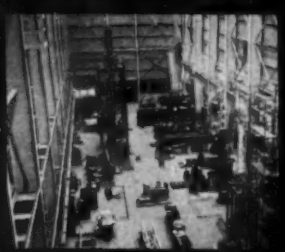
IN OVER 130 PRINCIPAL CITIES

LOCAL SERVICE TO UTILITIES THROUGH COAST-TO-COAST WAREHOUSING

	DESIGN	DEVELOPMENT	MANUFACTURING
1956 CONSTRUCTION BEGINS	 300 ton pressure vessel design complete.	Heat transfer burnout loop constructed.	Test facilities constructed.
1957 DRESDEN 30% COMPLETE	 Two-phase flow loop piping studied.	 Tests begun at APED Vallecitos lab.	Pressure vessel fabricated.
1958 SYSTEMS TESTING UNDERWAY	Cruciform control rod fabricated.	Dresden core mocked-up in critical facility.	300,000 fuel pellets fabricated a month.
1959 DRESDEN CRITICAL	Fuel sample system redesigned.	In-core instrumentation developed, built.	 Control drives designed, tested, built.

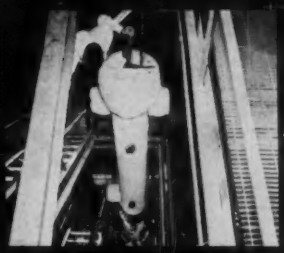
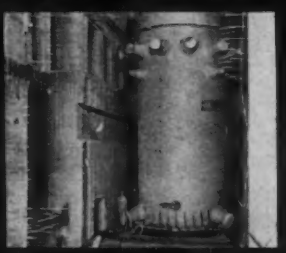
Dresden completed on time, on budget by General Electric project management

Utilities can now factor nuclear power stations into their system planning schedules, confident that they will be reliable power sources, constructed on schedule, and built for a firm price. General Electric's successful completion of the Dresden Station for Commonwealth Edison and the Nuclear Power Group*—on time, within budget—has proved this possible.

Major construction was completed within 13 days—criticality achieved within three days—of the scheduled target date set by G.E. 42 months earlier. Dresden reached rated power of 180,000 kilowatts net on June 29, 1960, following an extensive planned testing program. On October 12, Dresden was formally dedicated and is now serving as a reliable addition to Commonwealth Edison's system.

General Electric
Boiling Water Reactor Technology
Helps Lower Nuclear Power Costs

VALLECITOS BOILING WATER REACTOR

CONSTRUCTION	EQUIPMENT TEST	INSTALLATION	TESTING—LICENSING
Construction schedule set in 1956.			Atomic Energy Commission issues construction permit CPPR-2 after safeguards review of site and preliminary plant design. Certificate of Convenience and Necessity issued by State of Illinois for plant construction.
Tons of rock excavated for sphere.	 Instrumented drives scram tested.		Sanitary Water Board, State of Illinois, issues permit for sanitary sewerage system. Preliminary Hazards Summary Report submitted by Commonwealth Edison Company to Atomic Energy Commission.
Sphere segments welded before erection.	Sphere pressure tested to 37 lbs/in².	Instrumentation system installed.	U.S. Army Corps of Engineers issue permit for intake and outfall canals. Atomic Energy Commission issues license to store fuel at site. Certificate of Registration received from Illinois Department of Public Health.
Construction complete Oct. 13, 1959.	Turbine tested at site.	 300 ton pressure vessel erected.	Dresden critical testing—Oct. 15, 1959.

A General Electric project management team coordinated the myriad complexities of building this first large-scale nuclear power station. Planning, development, design, construction, and scheduling of products and services from more than 1500 suppliers and sub-contractors, were directed and integrated by the project management team. Bechtel Corporation was the engineer-constructor.

For the detailed story of the Dresden Nuclear Power Station, write General Electric Co., Schenectady 5, N. Y. Request brochure GED-4275. For further information about General Electric's capabilities in the field of nuclear power generation or atomic products, contact your nearby G-E Sales Office or write to General Electric Company, Atomic Power Equipment Dept., San Jose, California.

132-07

* *American Electric Power Service Corp., Central Illinois Light Co., Illinois Power Co., Kansas City Power and Light Co., Pacific Gas and Electric Co., Union Electric Company of Missouri, Bechtel Corp.*

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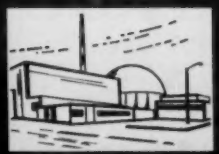
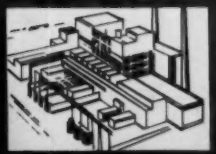
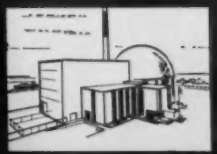


DRESDEN NUCLEAR POWER STATION



HUMBOLDT BAY NUCLEAR POWER STATION



BIG ROCK POINT POWER PLANT

MELTING ALLOY RELAYS

TOM HUGHES, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

Motors and Controls—XVII

When we come to our old friend, the solder-pot relay, we find much the same virtues and faults we have covered in the bimetallic relay. Since it is likewise triggered by thermal heaters that handle the motor supply current, the same principle of mirroring the heat conditions existent in the motor will hold true.

In two aspects the solder pot is more desirable than the bimetallic. With the highly refined eutectic alloys the actual range of tripping can be held to a narrower pattern. Second, the alloy can be used as a heat sink for a much longer life without any deterioration. There is no question that heating and cooling of any bimetallic assembly is going to cause eventually a noticeable alteration of its reaction pattern.

On the other hand, the solder pot takes a little more room to accommodate it and (in general) it can not be furnished with provision for automatic resetting. But it is still the favorite product of some progressive manufacturers of motor controls.

Since its operation is geared to a melting point, one has only to control the proper blending of the alloy to turn up with a basis for computations as standard as the voltaic cell or setting of thermometric limits to the temperature of boiling water. Thus these manufacturers have been prompted to arrange different series of heater applications for the solder pot and can provide slow or fast acting relays. In general, though, the solder pot is faster acting than the bimetallic actuated relay.

For a pronounced retarding of action, some manufacturers apply a saturable core transformer with either the solder pot or bimetallic relays. Coupling the relay heater to the secondary of a one-to-one transformer, it will receive the normal running current as before. However, during high inrush of start-currents, the core will saturate and the current passed on to the heater will be pegged at that point regardless of the amount being handled by the primary.

Now all these features are very intriguing and we Americans are prone to enrapturement over gadgets. But let's not lose sight of the fact that what we are really after is to curtail hot spots in motor windings. So let's not get too involved in how we produce a little heat in a remote starter box till we know we have correctly analyzed the motor duty cycle.

The Magnetic Overload Relay

Commonly known as the dashpot relay, this is the most versatile and accurate of the noncoordinated motor protective devices. It reached its present state of refinement while the thermal units were in their infancy. But it will never achieve the same popularity because it is much more expensive; takes up considerably more room; and requires adjustment by someone versed in the many factors of motor application that we have tried to present in this series of articles.

Of course, any good mechanic can play with its various adjustments in a hit-or-miss fashion and achieve a fair approximation of matching motor characteristics if he keeps a close watch of the motor temperatures over a period of time. But a plant engineer who is practiced in motor applications and load duty cycles can take the adjustment curves supplied by the relay manufacturer and quickly set the various components of the relay to a close approximation of the need.

There are two general classes of magnetic overload relays: the dashpot or time-limit class (which is the best known) and the instantaneous class. The latter is used with crane motors and other motors that operate within limits of travel and are not concerned with starting-current. They can be slip-ring motors, torque motors and other types in which the starting current is essentially their running current.

The only significant difference between the two classes of relays is that the time-limit class has a dashpot suspended from its armature and the instantaneous does not. The instantaneous consists of a magnetic coil (with its current factor properly chosen for the particular motor); a suitable armature, which moves up and down a vertical axis guide through the center of the coil; and the mechanism above the coil that the armature is arranged to trip.

The tripped mechanism may comprise contacts that open or close a control circuit or it may be mechanically linked to a latch on a circuit breaker or other control device. Actually, the instantaneous trip is a misnomer because we set it so it never trips except on an electrical short or a mechanical mishap within the driven machinery. The term is used because the armature can bounce up against the trip device with no retardation except its own inertia while the dashpot armature always has to drag the dashpot along.

Anyone who has played with solenoid-operated mechanisms knows that the armature has a distinct effectiveness when it is completely surrounded by the coil but its pull falls off in a steeply descending curve as it is backed out of the solenoid by its limits of travel. This relation between the excited field of the coil and the mass retardation of the armature is the basis of operation here.

The armature moves up and down either in a brass (nonmagnetic) guide or on a threaded spindle. This guide can be adjusted up or down (in or out of the coil) to limit the amount of pull or the armature can be moved up or down the threaded spindle by rotating on the thread. If all factors have been happily correlated the field generated by the motor current flowing through the coil will float the armature up somewhere near the tripping point but its own mass or some spring loading will resist the efforts of the field to cause tripping. In the event of a sudden surge of current through the coil, however, the armature will lunge upward and trip the mechanism.

Now you can see that the only features that could alter this simple process would be friction in the guide or change in the field from shorting of coil turns or such. There is no critical alloy or thermal upsetting which can deteriorate or alter correctness of setting. And, of course, the other distinct advantage over the thermal relays is that ambient temperatures have no considerable effect on its operation.

This last advantage is altered, however, when we attach a dashpot to the armature.

(Continued next issue)

here it is! A REAL

ONE-HAND TOOL

installs

INSULINK® and LINKIT®

one crimp per end!

You'll like this ONE-HAND TOOL ... from start to finish, you can really work it with only ONE HAND. You can close it with less than a 50 lbs. squeeze; it weighs only 2½ lbs. and is only 12" long. You couldn't ask for an easier service tool ... it's the only *real* ONE-HAND TOOL.

Position the OH25 once ... and only once ... on each side of the INSULINK or uninsulated LINKIT. It has a new die that crimps the entire contact area at one time. You don't have to reposition, you can't overlap crimps, and you never make less than the proper number of crimps.

And, it takes only ONE CRIMP PER END ... a series of easy, ratchet controlled strokes to make a perfect crimp every time. The new dies cause the conductor strands to rub together, removing the oxide film for more stable, low resistance connections.

Insert stripped wire ends into INSULINK; caps grip and hold conductors.

Get up close to your work. Position ONE-HAND TOOL on INSULINK only once per crimp.

A series of easy strokes complete the crimp. Dies produce oxide removing wiping action between conductor strands.

ANOTHER MAJOR DEVELOPMENT IN THE

BURNDY

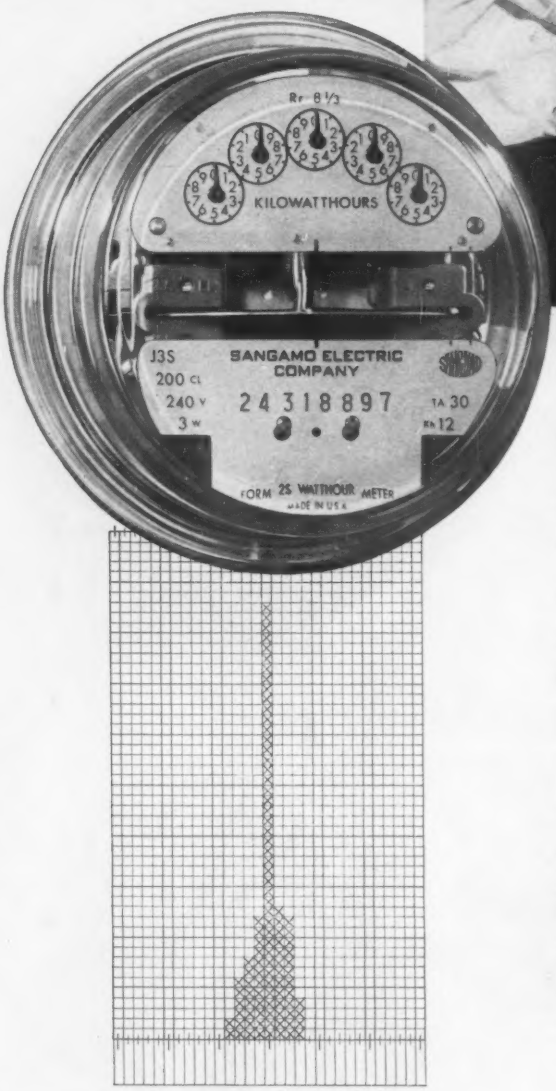
COMPRESSION PROGRAM

NORWALK, CONNECT. BICC—BURNDY Ltd. Prescot, Lancs., England In Continental Europe: Antwerp, Belg... TORONTO, CANADA

true MAGNETIC flotation

J3

THE METER BUILT FOR SAMPLE TESTING



Utility meter departments employing sample acceptance and service tests can depend upon the good $\bar{x}$ and σ results of Sangamo's new J3 to assist in reducing operating costs.

tremendous teammates

Sangamo J3 meters and sample testing are tremendous teammates. The J3 was designed with sample testing in mind...Its original accuracy and dependability will remain constant for many, many years. This goal was achieved by combining J3 True Magnetic Flotation with highest torque, slowest speed, high surge resistance, and a balanced moving system to give calibration stability.

Successful acceptance and service sample testing programs require the high sustained accuracy and long term service dependability inherent in Sangamo's new J3 meter.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM60-10

Manufacturers—Distributors

► **Sierra Switchboard Co.** has started construction on a 16,000-sq-ft production plant in Menlo Park, Calif. Initially it will have 1,600 sq ft for office and 14,400 sq ft of production area. In addition to the lighting panel and meter board production area, there will be five separate switchboard manufacturing areas permitting five major jobs to go on simultaneously. Sierra Switchboard was founded in 1954 by Arnold Fehl, now president, and Colin J. Shirley, vice president and treasurer. Both were formerly with Safety Switchboard, Oakland, Calif.

► **John M. Vranizan** has joined **Andrew L. Polich,** 734 N. W. Glisan, Portland, as sales engineer. The firm has been appointed Northwest representative of the Morrison-Pelsue Co. of Denver, Colo.

► Portland offices of the **Allis-Chalmers** industries group will be moved in November from the Cascade Building to 2300 S. E. Beta St.

Featherstone

Bradbury

Right Words, Wrong Face

The report of William Featherstone's appointment by Hubbard (November, p 60) was correct but the accompanying picture was that of Graybar's C. C. Bradbury. Our apologies to the two gentlemen, whose pictures appear above. Featherstone is Hubbard & Co.'s product sales manager, West Coast Division, with headquarters at Emeryville, Calif. Bradbury is financial manager in Graybar's Northwest District office, which recently moved into new quarters at 1919 Sixth Ave. S in Seattle.

► **G-E's Computer** department, which has headquarters in Phoenix, has announced it will open 11 new data processing centers and 10 additional sales offices in major cities across the nation. Expansion is in anticipation that industry shipments of commercial computers equipment will increase 33% within two years, according to a company spokesman. The department now has two data processing centers, both in Arizona, one at Phoenix headquarters, the other on the campus of Arizona State University in Tempe. There are 16 sales offices. According to C. C. Lasher, general manager, the computer department in Phoenix has doubled its output each year since it was opened in 1956.

► **Wells Mfg. Co.** and **Wells Commercial Sales Co.** have expanded with new offices at Harbor Way and Littlefield Rd. in South San Francisco. The company deals in commercial cooking and heat sealing equipment and other electrical products.

► **Keystone Mfg. Co.** has announced new sales representatives in the West. **Calhoun & Poxon,** 5429 Alhambra Ave., Los Angeles, southern California and Clark County, Nev.; **John Allen Ware & Associates,** 721 W. Buchanan, Phoenix, State of Arizona.

► **Graybar Electric Co.** is now distributor for **Reynolds** aluminum products for the electrical industry in southern California and Arizona.

► **J. H. Stumph** is representing **Harvey Aluminum** rigid conduit in the Northwest. His offices are at 1000 Fourth Ave. S., Seattle, and 1504 N.W. Johnston in Portland. Another recent appointment announced by Harvey Aluminum is that of **A. A. Gingell Co.** as sales representative for its new aluminum rigid conduit line in northern California and in Reno trading area. Offices are at 66 Ritch St., San Francisco.

► Acquisition of **Pioneer Electric,** a Canadian electrical equipment manufacturer, by **Federal Pacific Electric** Co. has been completed. Frank H. Roby, executive vice president of FPE, said that the company's Canadian subsidiary, Federal Pacific Electric of Canada, and Pioneer will be kept as separate entities, with their own managements.

► **Ohio Brass** Co. will acquire the assets of **Timpte** Bros. Inc., Denver manufacturer of trailers and truck bodies. According to O-B President Roger A. Black, the Timpte company will be operated under the direction of Holan Corp., a wholly owned subsidiary of Ohio Brass.

New Sales Offices

Geiger

Knowles

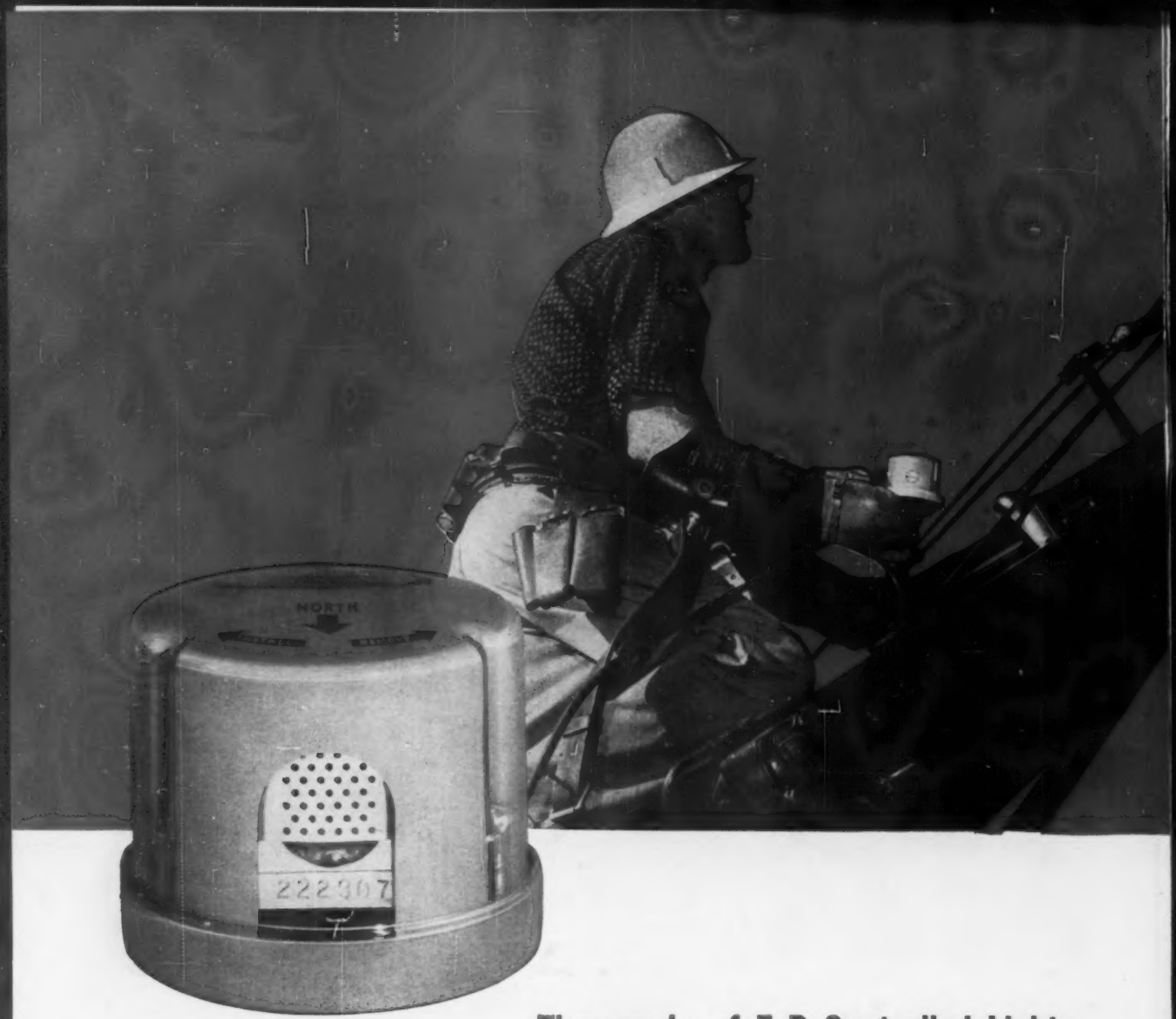
Two new West Coast district sales offices — at Portland and Seattle — have been set up by I-T-E Circuit Breaker. **George W. Geiger** is handling the Portland operation and **William V. Knowles** is manager at Seattle. Geiger had been working out of the Philadelphia office and Knowles goes to Seattle from San Francisco, where he has been field application engineer since 1955. The two areas were previously served by Garland-Affolter Engineering Co. and the change is in keeping with company policy to establish direct sales representation throughout the country. The Portland office is at 1010 S.W. 14th St. and the Seattle office at 910 Fifth Ave., Suite 300.

► **General Electric** Co. will build a new branch office, warehouse and dealer display center in Beaverton, a suburb of Portland. B. L. Haywood, Northwest district manager, said that the new $750,000 facility will house sales and distribution departments and the major appliance division.

► Production and maintenance employees of **Heiland** Division, Minneapolis-Honeywell Regulator Co., rejected the IBEW Local 1823 as their bargaining agent. NLRB officials said 171 employees voted against union representation and 86 voted for it. There were 264 eligible to vote in the election conducted by mutual consent of the company and the union.

► William A. Petro, president of **Apextro** Products Co., maker of radiant heating equipment, has announced expansion of his company to a second location at Los Angeles to be designated as Apextro plant No. 2.

► **Ray Johnston Co.** of Seattle has been appointed to represent **Pacific Automation Products.**

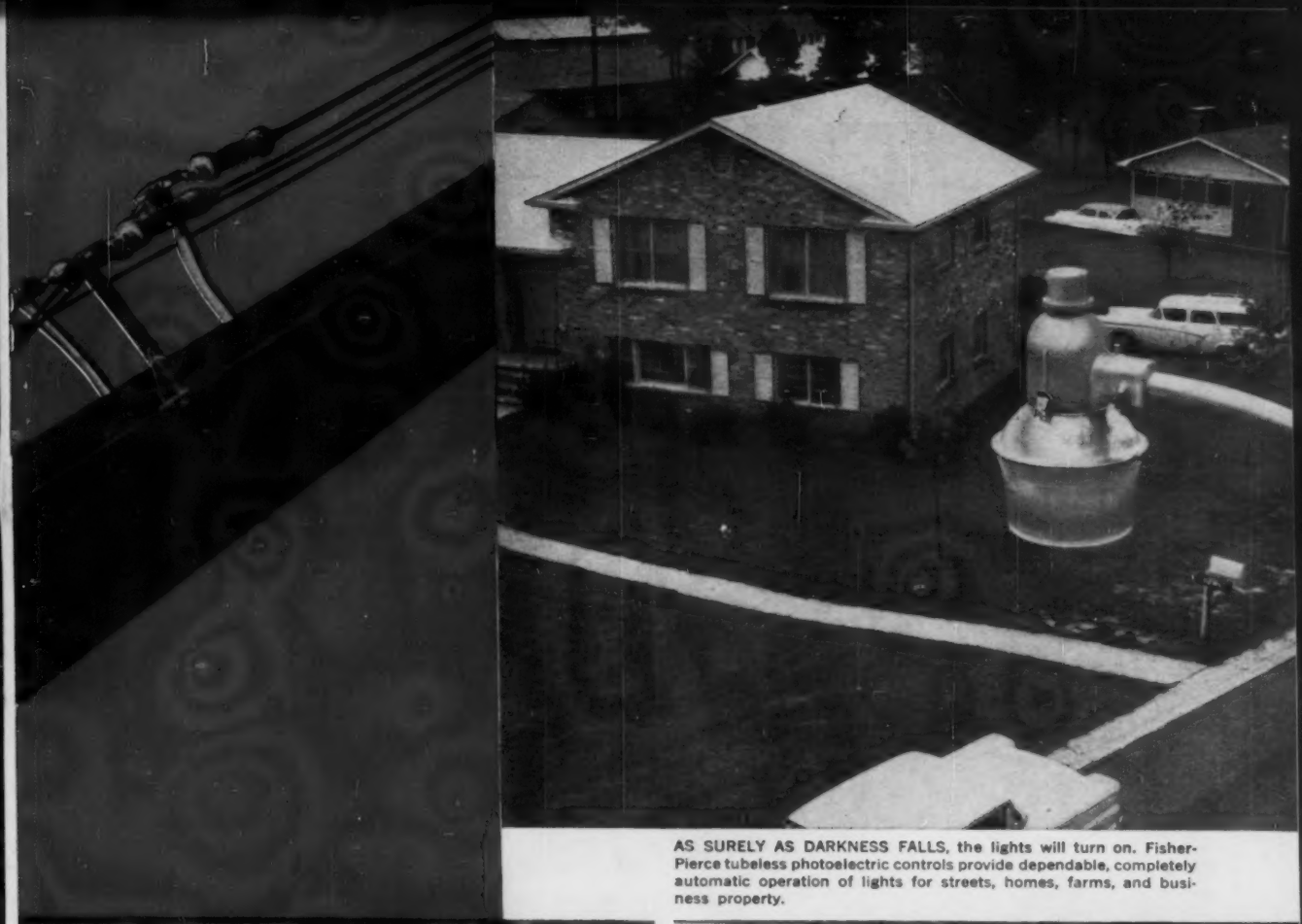


Thousands of F-P Controlled Lights Keep Duke Power's Area Bright as Carolina in the Morning

Nothing could be finer for back yards, barnyards, and business property — than adequate, automatically controlled lighting. That's the reason why increasing numbers of Carolinians are taking advantage of Duke Power Company's low-cost unmetered lighting service.

Fisher-Pierce Series 6600A Controls operate thousands of incandescent and mercury vapor lighting units that are provided for a flat charge of $3.00 per month — a rate made possible by connecting the lamps into existing 120-volt lines. Installation, power and maintenance are also included in this rate, but the use of reliable F-P controls helps to reduce maintenance to little more than replacement of burned out lamps.

Photoelectrically controlled all-night lighting is an excellent off-peak load builder for the utility. And for their customers, all-night lighting gives them economical protection from burglary and vandalism — as well as the reassurance of coming home at night to well-lighted surroundings. Regardless of season, time of day or the weather, Fisher-Pierce controls dependably turn lights on whenever they are needed.



AS SURELY AS DARKNESS FALLS, the lights will turn on. Fisher-Pierce tubeless photoelectric controls provide dependable, completely automatic operation of lights for streets, homes, farms, and business property.

MORE THAN ONE MILLION KW will be the capacity of Duke Power Company's Allen Plant. Already completed are four of the five units in what will eventually be the largest steam-electric power generating station in the South Atlantic states.

TOWARD NUCLEAR POWER — Duke Power Co. and three other major electric companies serving the Carolinas and Virginia have joined in planning and construction of a 17,500 KW nuclear power plant, scheduled for operation in 1962.

For complete design information and operating specifications on Series 6600A controls, write The Fisher-Pierce Co., 43 Pearl Street, So. Braintree 85, Massachusetts.

FP

FISHER PIERCE

Electrical and Electronic Equipment for Industry, Utilities and the Home

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

This KEY

Does Away with

EAR CLIPPING

You Asked For It—And Now It's Here—for Our No. 190-NR Series

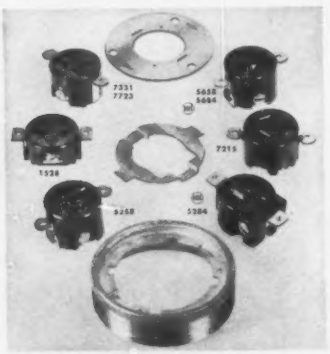
FULLMAN'S
Adjustable
STEEL BOX
190-NR Series
No Receptacle

A standard 4" octagon, brass-topped watertight floor box 2½" deep with brass adjusting ring permitting ½" height adjustment in addition to three screw legs 2½" long.

Box-body has 3¼" opening, making it easy to get hand into for conduit attachment or wire pulling.

Concrete can be poured to very top, also to box-body height only. A second tin lid is provided.

Fits most popular styles and size receptacles.



TO INSTALL—Drop the "KEY" into special slots built into adjusting ring—select the receptacle required and simply "LAY-IN"; then "LAY-ON" receptacle ring. This has been added at no extra cost. Very easy to install.

Sold Only Thru Wholesalers

Fullman
MANUFACTURING COMPANY
1209-1215 JEFFERSON ST.
LATROBE, PENNSYLVANIA

► Consolidation of the steam turbine and heat transfer departments into the new thermal power department has been announced by **Allis-Chalmers Power Equipment Division. J. H. Burrus** has been appointed manager and **John M. Crawford** assistant manager of the department. Burrus had been an assistant general manager of the Power Equipment Division since 1956. Earlier he was manager at Portland.

► Federal Pacific Electric Co. has set up a district sales office in Denver, Colo., with **Phil K. Donnelly** as manager. **Harry E. Knudson,** director of sales, said that the new office would be at 1401 S. Lipan St. and would serve the State of Colorado and parts of Wyoming and South Dakota. Donnelly joined **FPE** in 1952 as a field engineer in the Indianapolis area and was made district manager at Indianapolis in 1955.

Donnelly

► **Robert C. Thorburn** has been named manager of a newly formed nuclear safety subsection at G-E's Vallecitos atomic laboratory in Pleasanton, Calif. His duties will include responsibility for nuclear safety for the entire Atomic Power Department and for AEC licensing procedures.

► **O. A. Gustafson** retired last month from General Electric Co. after 37 years of service, 18 of them in San Francisco. He joined the company after receiving a BS in electrical engineering from the University of Idaho and moved to the Bay area from Los Angeles in 1942. In 1945 he was named Pacific District manager of installation and service engineering, covering northern California. In 1955 his district was enlarged to include Oregon, Washington, Idaho, Alaska and Hawaii.

Gustafson

► **Wayne C. Wells Co.,** 6055 N. E. Glisan St., Portland, held an open house recently to introduce its new line of International electric hot water baseboard heaters.

O'Neill

Ramsey

► Two new appointments in Day-Brite Western sales operations were announced recently by Carl L. Powell, Western Division general manager. **James C. Ramsey** has been made Western regional sales manager and will be responsible for field sales personnel with headquarters at the company's Santa Clara plant. **Leon P. O'Neill** has joined the staff of Brundage Lighting Associates, Day-Brite's San Francisco representatives, located at 821 Howard St. He will cover the San Jose area left vacant by promotion of Ramsey. O'Neill formerly was customer service manager at Day-Brite's Santa Clara plant.

► **Floyd E. von Ohlen** became San Francisco regional representative for Electro-Motive Division, General Motors, on Nov. 1. He joined Electro-Motive in 1942 as an engine tester and has been manager of utility sales in the division's Chicago region since 1959.

von Ohlen

► **Walter A. Matzinger,** who retired from Westinghouse recently, has joined **Wheatland Electric Products Co.** and represents it at 1417 S. Georgia St., Los Angeles, for southern California.

► **Robert M. Cohen** has been named manager-superheat reactor physics at G-E's Atomic Power Equipment Department at San Jose.

► **Harry W. Lawson** has been named manager-atomic power plant market development in General Electric's newly established Electric Utility Sales Operation.

► **Capital Wholesale Electric** in Sacramento, according to E. J. Duffy, its new owner, has been named local distributor of residential lighting fixtures for **Lightolier Co.** Jack Cook has joined the sales staff.

► Reynolds Metals Co. has announced that **Roland M. Caldwell,** electrical engineer, has been employed to assist utility engineering, design and construction departments on the West Coast. He will be headquartered in the company's Los Angeles office, according to **John T. Shields,** Pacific regional industrial sales manager.

Caldwell

Death Takes Pioneers

George B. Fluehr

George B. Fluehr, who started his career in 1904 at age 19, died Nov. 1 at Salinas, Calif., where he was still active in the industry as Kuhlman Electric Co.'s Western region manager. Apprenticeship with a telephone manufacturing company in Chicago gave him practical information about switchboards and electrical equipment and convinced him that his future lay in that field.

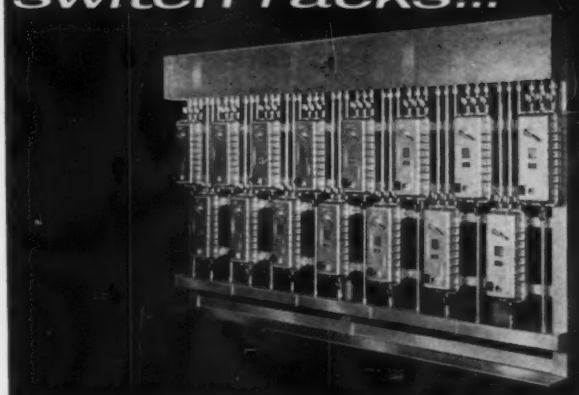
With Amboy Light & Power Co., a dusk to midnight operation, he got experience with every phase of operation and when Illinois Northern Utilities Co. was formed, he was made a district superintendent. In 1930 he became vice-president; in 1934 was placed in charge of operations; in 1950 was elected president. When the utility merged with Public Service in 1950 he was made executive officer of Illinois Northern Division, retiring in 1952.

In 1954 he was asked to go to California to supervise construction of Kuhlman's new distribution transformer factory at Salinas. He became a member of the PCEA and a director of the Monterey County Industrial Development. A son and grandson followed him into the industry: George R. Fluehr, Kuhlman president, Birmingham, and Kuhlman Fluehr, manager at Salinas.

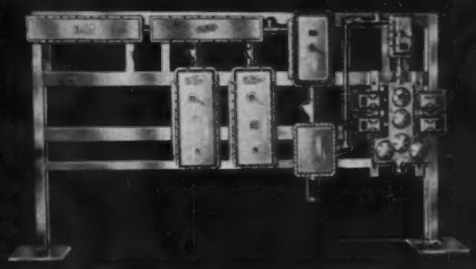
Joseph N. Kelman

Joseph N. Kelman, pioneer in the field of power circuit breakers, died recently at the age of 86. His death followed a lengthy illness, which forced his retirement in 1956. In 1901, Mr. Kelman built his first successful oil circuit breaker. He went into business in 1906 and was active as president of his company until his retirement. He was founder of the Kelman Electric & Mfg. Co. in Los Angeles, now a division of I-T-E Circuit Breaker Co.

Killark custom-made switch racks...



designed and built to meet your needs...exactly



Your worries are over from the moment you choose Killark custom-made switch racks because Killark provides a complete service — design to assembly. First, Killark prepares and submits a preliminary blueprint of the entire unit, drawn to your specifications. After approval, the switch rack is assembled, wired, and sealed *at the factory* by Killark workers with experience and equipment to do the job right. You receive a switch rack ready to install.

The two racks shown are examples of the type of custom-made units Killark can provide. Each has been made to meet the users exact specifications, and is completely pre-wired and pre-sealed. Killark's rust-proof, non-sparking *aluminum* enclosures have been used throughout the assemblies to give added years of trouble-free performance.

You get these extras when you order Killark custom-made racks:

Services of expert Killark engineers • One supplier for all components • Dependable Killark aluminum enclosures • Fast delivery • Easy installation.

Racks for outdoor or indoor, hazardous or non-hazardous locations. Write for complete literature.

Killark
ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Aves. • St. Louis 13, Mo.
Sales Representatives and Warehouse Stocks in Principal Cities
6021

Killark Supplies Everything But the Current!

For phone number of closest representative see advertising index in back of book.

PRODUCT NEWS

New Designs and Applications

(1) Surveyor takes a distance measurement reading on the electronic distance measuring unit at Black Mountain, Idaho, while helicopter stands ready to whisk him off to the next point of the pipe line project, Cubic Corp., San Diego 11, Calif.

ELECTRONIC SURVEYING SYSTEM CHARTS PIPE LINE

An electronic distance measuring system (Electrotape), a small surveying crew and a helicopter slashed days and weeks off the project establishing microwave stations along the 1,400-mile Pacific Gas and Electric Co. pipe line.

The new pipe line, when completed, will stretch from San Francisco to Alberta, Canada, running through Oregon, Washington and Idaho.

The electronic system determined the location of the microwave stations by measuring the distances between the proposed sites on the route, and the attenuation of a microwave signal over the distances spanned.

Any distance from 250 ft to more than 60 miles could be measured as the system, consisting of two identical, portable, tripod-mounted transmitter-receiver units, automatically computed the time taken for a microwave signal to travel from one unit to the other and back.

The time measurement was read out directly in digital form to the nearest twentieth of a millimicrosecond. This figure was easily converted into linear distances.

Albert V. Cocking, president of Aerial Control, Monterey Park, Calif., and subcontractor to PG and E and Bechtel Corp. for the microwave station planning, said that as many as 300 miles have been charted in a single day, as the helicopter lands long enough for the crew to make a measurement, then hops off to the next point.

"The crew works in two teams," he explained, "allowing fast movement along the route. As soon as a measurement is completed, the helicopter picks up the first team, and lifts it further down the pipe line route, leap-frogging over the second team. Another measurement taken, the copter picks up the second team and carries it down route jumping over the first team. One-shot measurements as long as 70 miles were made on the project—a major improvement over current methods.

The 76 microwave stations being located will control the flow of natural gas through the pipe line. Messages, beamed along the communications network, will control valve operation, check temperatures and isolate trouble areas in emergencies along the gas artery.

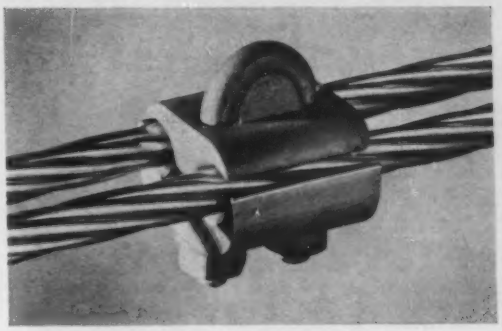
Initially, 415,000,000 cu ft of gas will be brought to California through the large-diameter line, which is expected to start operating during the winter of 1961-62.

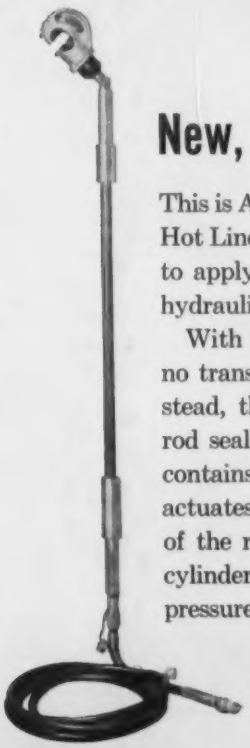
ALCOA ALUMINUM

ACCESSORIES ROUNDUP

Real progress in dead-ending

Here is a new design in a deadend clip, referred to as Cat. 2412. The big advantage is the fact that it installs with ease. Note the construction and you'll see why. It's a simple but significant matter of the U-bolt position. There is no need to take the clip apart in order to install it. Thus, no difficulties encountered with loose parts and time needed for pole-top reassembly of clamp components. Doing the same job as Alcoa's older Cat. 412, these new clips—installed in a loop deadend—will develop 95% of the rated strength of the conductor. Single clips will develop 80% of the rated strength of ACSR and 90% of the rated strength of stranded aluminum conductor.





New, power-operated hot stick

This is Alcoa's new 12-ton-capacity 12 HA Hot Line Tool. It provides a sure, safe way to apply the labor-saving convenience of hydraulic power to hot line work.

With this hydraulic hot stick, there is no transfer of oil from pump to tool. Instead, thrust is obtained by a fiberglass rod sealed in a fiberglass tube. The tube contains no oil. Oil pressure from the pump actuates a cylinder on the lower (cold end) of the rod. This rod, in turn, actuates a cylinder at the upper end which provides pressure to the compressor cylinder. Oil pressure at the cold end is provided through standard hoses connected to either a hand or motor pump.

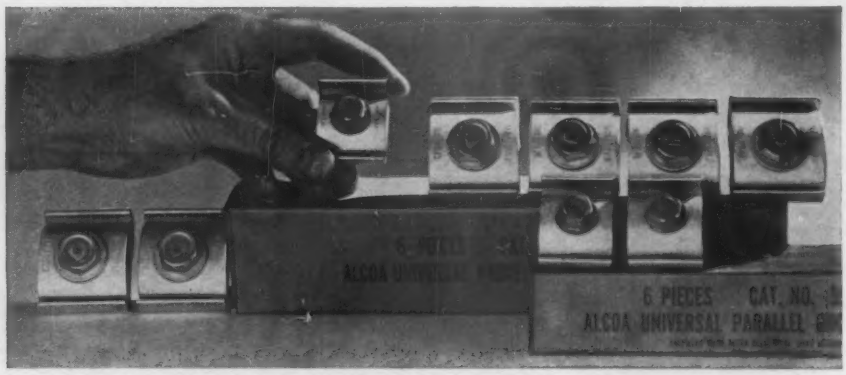
This tool has been thoroughly tested by cycling for leaks and under pressure overload. As an additional safety feature, the cylinders at the compressor end of the tool are covered with a phenolic housing, which extends from the quick coupler to the insulation.

Even in difficult operating positions, dies are always visible with this stick, since the head is placed at a 45° angle on the shaft. Over-all length is 7 feet 10 inches, with the insulated section 65 inches. The hot stick comes complete with quick couplers. More facts? Alcoa-Rome field advisors have demonstration models.

over ▶

Eliminates a mess

That's what Alcoa Filler Compound packaged in caulking tubes does. Designed for use with ACSR or stranded-aluminum compression accessories, it can be injected into joints or deadends by using any standard caulking gun. AFC performs the same function as zinc chromate paste with this important difference: *it is not messy to work with.* It won't splatter and stain. It will wipe from equipment and hands very easily. AFC also exhibits excellent temperature stability, staying greaselike and neither melting nor dripping from hot conductors. And it flows, even at 0° F. Complete directions for use are on the foil-labeled tube. Packaging is in cartons containing ten one-pound tubes. If preferred in bulk, there are one- and five-gallon cans.



Package with a purpose

Many parallel groove clamps prefilled with joint compound have been packaged in individual polyethylene bags.

However, there's one big problem with such a package. The loose fit allows the compound to smear not only over the inside of the bag, but *also* on the outside of the clamp. This means that some grease is lost from the groove, and the lineman, once he tears open the bag, has a messy clamp to handle.

Now Alcoa-Rome has a unique packaging approach. Six clamps in a row are packaged end-to-end in a cardboard container. This adds up to some good results.

FIRST: Clamps are easy to store, handle and count.

SECOND: Clamps are easily removed from the package in the field. Just slide them out one by one—no tearing or ripping of individual packages.

THIRD: Because the clamps are held in position relative to the package, grease from the prefilled grooves is not dispersed over the clamp surface. And, of course, there's no loss of joint compound from the groove, where it's needed.

Clamps are still packed in polyethylene bags for those who wish them that way. But we'd like to suggest that you give the improved Alcoa "6-pack" a try. Available in two sizes: Cat. 396.6 D and 392.6 D.

Summing up:

Alcoa's new Cat. 2412 deadend clip has greater convenience for loop-type deadends.

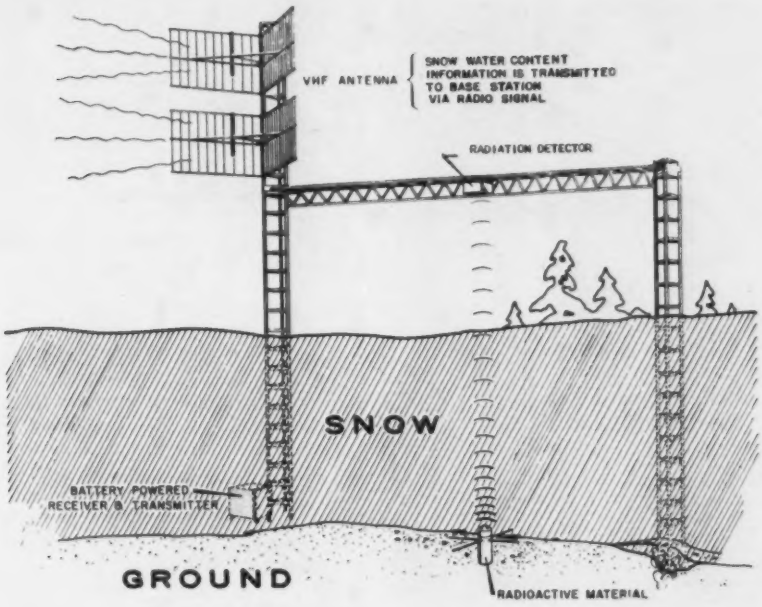
New hydraulic hot stick puts *power* to work on hot line.

AFC filler compound in caulking tubes makes neat, unspattered installations.

Parallel groove clamps are now available in a cardboard "6-pack" that helps eliminate messiness.

Your nearby Alcoa-Rome salesman is eager to supply additional information on any or all of these items. Why not call him today? For the name and address of our nearest representative, write to Rome Cable Division of Alcoa, Dept. AR-3, Rome, N.Y.

ROME CABLE
DIVISION OF **ALCOA**



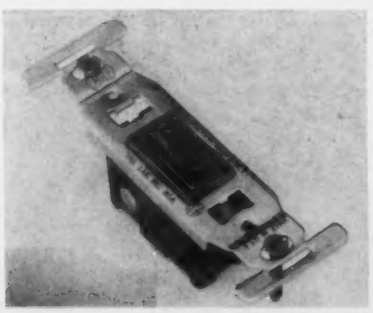
Radioactive Snow Gage Telemetering System

(2) *Sierra Electronic Corp., Division of Philco Corp.,* 3885 *Bohannon Drive, Menlo Park, Calif.*

To improve upon present sampling methods to determine the water content of snow, the Corps of Engineers developed an electronic gaging device. Sierra model 211A telemetric system assembly was designed to utilize this method.

The basic method consists of measuring and recording the radiations which traverse through snow from a radioactive cobalt source located a certain distance from a scintillation detector. A small amount of radioactive cobalt is placed just below the surface of the ground and the radiation detector is placed 15 ft directly above the ground. As radiations pass from the cobalt source through the snow to the detector, some of the radiations are absorbed by the snow according to its water content, and do not arrive at the detector. Only the water content, not the depth of the snow, affects the intensity of the radiation. Therefore, measurement of the resulting radiation at the detector provides a means for measuring the water content of the snow.

The gaging site with the cobalt is usually remotely located at high altitudes in mountainous regions where the snowfall is heavy, making the installation inaccessible for many months at a time. By means of radio communications (telemetering), the electrical pulses from the detector (which corresponds to the cobalt radiations arriving at the detector) can be transmitted from the gage site through a chain of radio relay stations to a base station out of the deep snow area, where the information can be displayed or permanently recorded in printed form on a paper tape.



Wall Switch

(3) *Eagle Electric Mfg. Co., Inc.,* 23-10 *Bridge Plaza South, Long Island City* 1, *N. Y.*

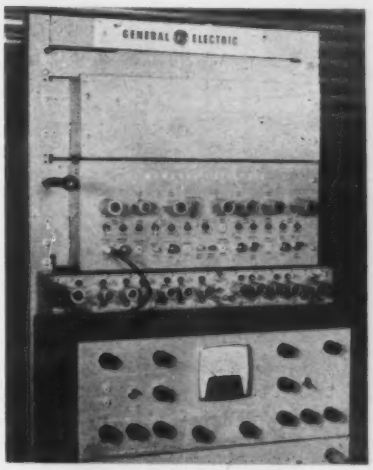
Eagle introduces its Touch-a-Matic switch for 120–277 v a-c. Said to be the only switch with both screw and pressure terminals, the manufacturer states it is also instant acting when rocked, pushed or touched. Switch has easy wire and screw terminals.

Automatic Grounding Switch

(4) *I-T-E Circuit Breaker Co.,* 1900 *Hamilton St., Philadelphia* 30, *Pa.*

A new compact, economical, automatic high-speed grounding switch has been developed by I-T-E. The switch is rated from 15,000 to 230,000 v with a momentary current rating of 20,000 or 40,000 amp.

Normally the grounding switch is in its open position, with the gap distance between line contact and grounded blade coordinated with the insulation level. In case of an internal transformer fault, a differential relay energizes a solenoid which, in turn, unlatches the latching system of the spring mechanism . . . the charged springs accelerate the blade to high speed, resulting in fast closing and thereby creating a metallic ground fault, sufficient to cause the remote breaker to trip.



Microwave System

(5) *General Electric Co., Communication Products Dept., P.O. Box* 4197, *Lynchburg, Va.*

General Electric has introduced a new microwave system, designated type UA-6B.

Basically a duplex radio transmission set, the new equipment operates over the range of 5,925 to 7,450 mc, accommodating up to 240 voice channels for point-to-point communication.

Built into the control center are test facilities permitting metering of all critical voltage and currents, including RF power monitoring and control of stations without removal of covers.

*Trademark

"Superformed* spells S-A-F-E-T-Y to a SAFETY SUPERVISOR"

"We Safety Men must look at any piece of equipment from the *safety* angle.

"Fanner Superforms? Sure, they are safer for our linemen to handle. Not unwieldy . . . no tools required for dead-line application . . . easily controlled with hot-line tools . . . ends are carefully machined to prevent rubber-glove puncturing . . . safer than straight wires and aluminum ribbon."

Everywhere, Safety Engineers, *the men who guard the safety of people*, have a good word for Superforms.

A-1583 A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

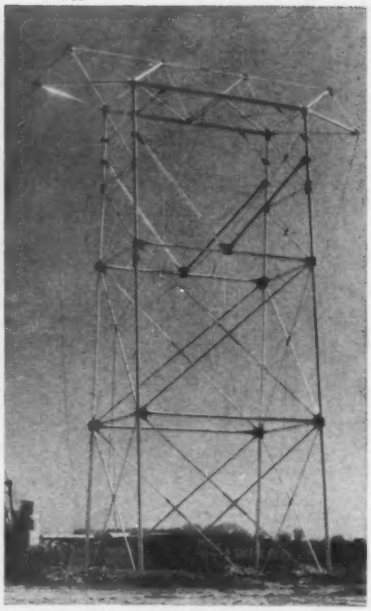
TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

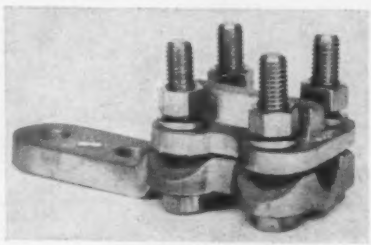


Aluminum Tower

(6) *Reynolds Metals Co., Reynolds Metals Bldg., Richmond 18, Va.*

Shown above is a general view of Reynolds new tubular aluminum transmission tower under test near Phoenix, Ariz.

According to the manufacturer, its engineers have proved to their own satisfaction and to the satisfaction of more than half a dozen utility companies the feasibility of using aluminum structures — thereby turning the small plant in Phoenix from an experimental station to a full-fledged manufacturing plant.



Power Connector

(7) *Gibbons Electric Co., P. O. Box 63, Santa Clara, Calif.*

The connector shown is said to be typical of the new line of power connectors offered by Gibbons Electric. This particular clamp, a universal reverse-cap cable terminal, is said to be suitable for cable sizes from No. 4 through 600 mcm. The groove in the body is shaped so that a given cap force produces more wedge-clamp effect with large cables than with small, according to the manufacturer.

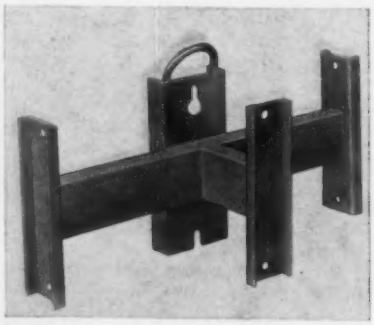
Power Fuse Enclosures

(8) *S & C Electric Co., 4435 Ravenswood, Chicago 40, Ill.*

New submersible metal-clad enclosures for power fuses have been announced by S & C. The enclosures, rated 13.8 kv and 95 kv BIL, are available off-the-shelf in two basic designs.

One design has a hinged door and accommodates S & C's solid-material boric acid power fuse type SM-5C, which have an interrupting capacity of 500 mva at 13.8 kv and a continuous rating of 400 amp.

The second design, intended for confined areas (mainly underground vaults), has a suspension-type door. This enclosure accommodates S & C's solid-state boric acid power fuses types SM-4B (200 amp, continuous) and SM-5B (400 amp, continuous). The SM-5B has an interrupting capacity of 450 mva, symmetrical, at 13.8 kv.



Recloser Cluster Mount

(9) *Turner Electric Co., 9510 St. Clair Ave., East St. Louis, Ill.*

This rack permits oil circuit reclosers to be mounted in the shop and then be hoisted into position in the field. When inspection or service is necessary, the unit is replaced with another oil recloser rack so there is a minimum of outage time. A NEMA arrester bracket can be attached to each channel for protection of OCRs. Two different units are available to accommodate either two or three OCRs.

Rack can also be used to mount 5-kva through 25-kva transformers.

Shelter House

(10) *Hupp Corp., Perfection Division, 1135 Ivanhoe Rd., Cleveland 10, Ohio*

Shown above is a portable shelter for personnel and electrical equipment installations. The shelters are said to be virtually indestructible as they may be floated ashore, dropped from helicopers or dragged over rough terrain without damage.

Recording Annunciator

(11) *Scam Instrument Corp., 3101 N. Lowell Ave., Chicago 41, Ill.*

This recording annunciator prints selected "off normal" and "return to normal" conditions on the signal from a variety of input devices such as pressure or temperature switches, limit switches, overspeed switches or overload relays.

The printed record includes the specific condition, and the month, day, hour, minute, relieving operating personnel of logging duties.

ROYAL Portable Cords

are dependable, easy working, made right to be right on every job, time after time after time. Royal is the BIG line, too . . . rubber, neoprene and thermo-plastic, as well as lamp cords, fixture wires, machine tool wires, thermo cables, bell wires, coaxial cables, and more. All packaged for fast, easy identification. So when you buy wire and cable, specify ROYAL, the line that's preferred by electrical men everywhere. See your wholesaler, or write for catalog, giving wholesaler's name.

ROYAL ELECTRIC ... an associate of

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In Canada: Royal Electric Company (Quebec) Ltd.
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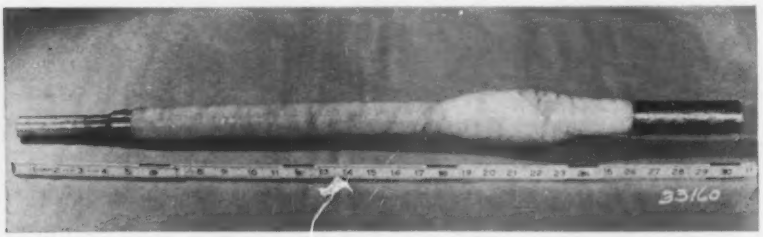
SALES REPRESENTATIVES AND WAREHOUSES: Los Angeles—1950 Naomi Avenue, RI 7-9655; San Francisco—1225 Sixth St., HE 1-5792; Seattle—4130 First Ave., So., MA 3-8882; Phoenix—221 E. Camelback, CR 7-1662 Denver—110 Yuma, SH 4-1351

Hot Line Bucket

(12) *Holan Corp.*, 4100 *W. 150th St., Cleveland, Ohio*

The Holan Corp., in conjunction with American Electric Power Service Corp., has developed a new technique for working with bare hands on energized power lines.

Linemen work while standing in a fiber glass bucket hoisted to overhead wires by a truck-mounted insulated aerial boom. The bucket is lined with a metal mesh that is connected by clamps to the conductor on which the men are working, thus energizing the screen and the occupants at the same voltage as the line. Their safety is provided by the insulated boom which protects them from the difference in voltage between the ground and the live conductor.



Cable Kit

(13) *Epoxylite Corp., P.O. Box 3397, El Monte, Calif.*

Epoxylite announces the availability of a cable accessory kit for making hermetic seals in pothead terminations on 35-kv paper lead cable.

According to the manufacturer, the cable is prepared in the normal manner over which a laminate of special epoxy resin and orlon tape is constructed by simple, brush-on and wrap technique. After construction of the laminate, the pothead is applied and filled with oil, leaving a small space for expansion.

Aluminum-Coated Strand

(14) *Bethlehem Steel Co., Bethlehem, Pa.*

Bethalume strand, a new aluminum-coated steel strand, has been added to Bethlehem Steel Co.'s line of coated strands and is now available.

Protected by a uniform coating of hot-dip-applied aluminum, Bethalume strand is recommended for use as messenger strand to support electrical conductors and telephone cables, as guy strand for poles, smokestacks and other structures, and as overhead ground or static wire for protecting electrical lines from lightning.

Outdoor Light

(15) *Prescolite Mfg. Corp.*, 2229 *Fourth St., Berkeley, Calif.*

Prescolite announces a new weatherproof fixture for flush installation in earth, concrete or plaster, for outdoor installation in gardens or around commercial buildings. The unit is constructed of cast aluminum and is sealed.

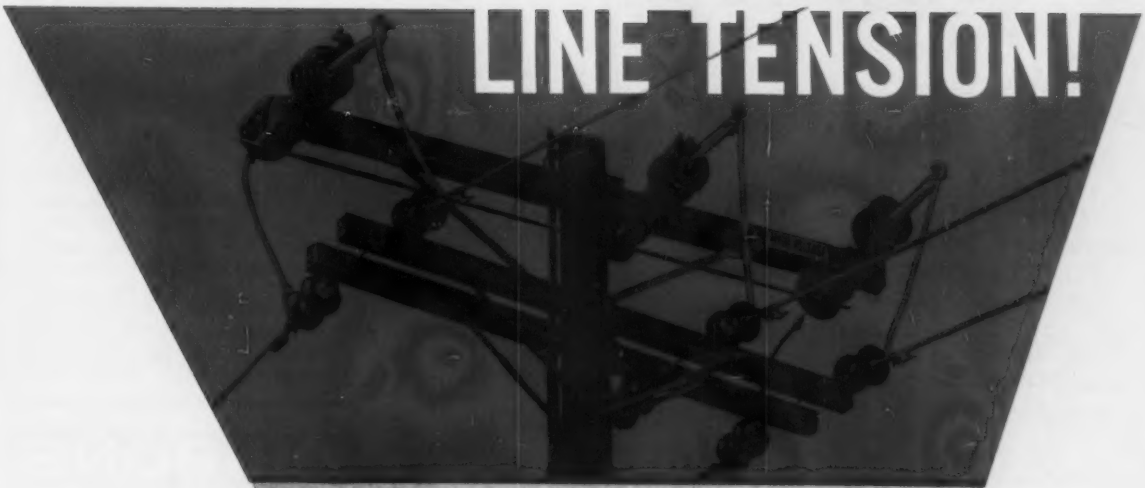
Discharge Valve

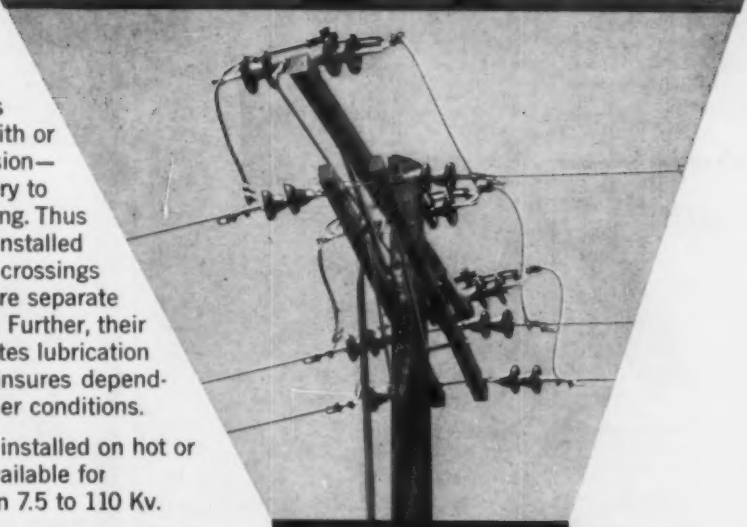
(16) *Allis Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.*

Expansion of its free discharge valve line with introduction of a new low head Howell-Bunger valve for use under 200-ft head has been announced by this company's York Works.

The valve is available in sizes from 12 in. to 108 in. in 6-in. increments. The free discharge valve is a throttling arrangement which operates from full open to full closed to permit water to be discharged to atmosphere from behind a dam.

INSTALL KPF SWITCHES WITH OR WITHOUT LINE TENSION!





KPF air break switches operate equally well with or without conductor tension—tension is not necessary to their smooth functioning. Thus KPF switches may be installed on angle poles, major crossings or other locations where separate deadends are desired. Further, their simple design eliminates lubrication or maintenance, and insures dependability under all weather conditions.

KPF switches may be installed on hot or dead lines, and are available for common voltages from 7.5 to 110 Kv.

Test KPF switches with an installation on your own system. Inquire now!

KPF ELECTRIC COMPANY
P. O. Box 1257W • Stockton, Calif.
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KPF
AIR BREAK SWITCHES
Standard for half a century

ANNOUNCING

PENGO-Prope

—the most satisfactory pulling line available today!

* GREAT STRENGTH
(9,600 lbs. tensile for ¾" diam.)

* LIGHT WEIGHT
(11.7 lbs. per 100 ft., ¾" diam.)

* HANDLES AND SPLICES LIKE MANILA
in any climate or weather.

* WATERPROOF,
(even salt water) can't mildew; excellent dielectric properties.

PENGO-Prope is a synthetic rope of special construction for pulling line use. Although PENGO has other synthetic and manila pulling lines, we believe PENGO-Prope far surpasses these ropes in cost-saving performance.

PENGO-Miller

LINE STRINGING SWIVELS

Special models of the well-known MILLER swivels redesigned specifically for tension line stringing use.

The result is a reliable, heavy duty swivel of proper dimensions to pass through stringing sheaves and bullwheel grooves easily, without damage.

PETERSEN ENGINEERING CO., INC.
Santa Clara, California
Phone: AXminster 6-7712

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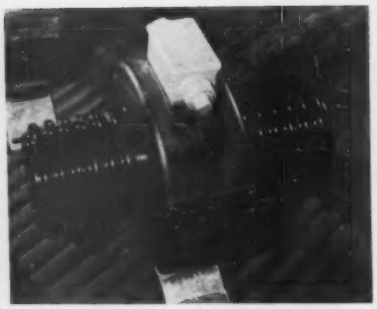

Metering Transformer

(17) *Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.*

Now in production at Allis-Chalmers Pittsburgh Works is a new epoxy-porcelain window type heavy duty, high current metering transformer.

Available in the 5-kv, 8.7-kv and 15-kv insulation classes in current ratings of 1,000 through 4,000 amp, the transformer has the creep-flashover characteristics of porcelain. The new transformer can be installed in any position.

Primary Meters

(18) *HD Electric Co., 760 Osterman Ave., Deerfield, Ill.*

A newly designed inverted housing for this company's primary voltage ammeters and related testing instruments has been announced.

The new inverted housing is designed to face directly downward or toward the ground. The company states that this new inversion feature makes it possible to take accurate readings from the ground.

SNAP!
THEY STAY ON.....
All VICTOR "MAGIC" CLAMPS and STRAPS for Thin and Heavy Wall Conduits have this time-saving snap-on feature.
Contractors everywhere are switching to VICTOR. Cash in on this heavy demand. Add these fast selling, profitable Clamps and Straps to your line.
Write for the new Victor Strap Catalog. Lists over 600 items to fasten Wire, Cable, Tubing and Conduit.
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Power Connectors and Bus Fittings
for COPPER or ALUMINUM
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600 Sizes
Made in The West
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CHerry 3-6698 918 DiGiulio Ave.
Successors to bus fitting activity of Federal Pacific Electric Co.

Drawout Protection

(19) *Pennsylvania Transformer Division, McGraw-Edison Co., Box 330, Canonsburg, Pa.*

The Loadmaster 100, a drawout protective device described as a completely new concept for low voltage (600 v) switchgear, has been announced by Pennsylvania Transformer Division of McGraw-Edison Co.

The Loadmaster 100 is an electrically operated fused interrupter switch utilizing bus high, interrupting capacity fuses. It has a rated interrupting capacity of 100,000 rms symmetrical amp. The dual-element fuses have sufficient time to lag to protect against needless circuit interruption caused by harmless overloads, according to the manufacturer.

Hot Line Tool

(20) *Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.*

Shown above is a new hydraulic hot line tool by Alcoa.

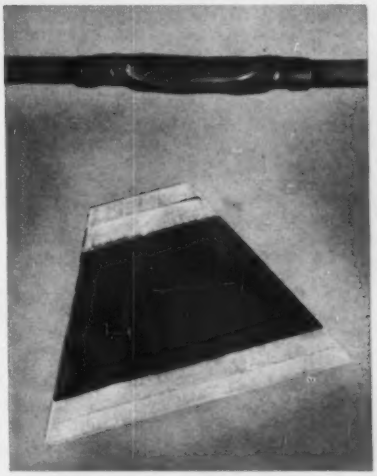
The 7-ft, 10-in. tool requires no special equipment as it may be operated from any 10,000 psi foot or motor-driven power pump equipped with standard hoses.

According to Alcoa engineers, the tool prevents fluid contact between tool and pump, thereby eliminating accidents resulting from use of improper or contaminated oil. The required thrust is obtained by a fiberglass rod sealed in a fiber-glass tube. Manufactured from nonconductive materials, the tube contains no oil.

Photo Control

(21) *Precision Multiple Controls Inc., 233 Chestnut, Ridgewood, N. J.*

PMC announces the availability of its tubeless control in meter-type housing. The control is mounted in a standard watt-hour meter base plate and enclosed in a shallow glass housing, otherwise it is identical with Precision's other photo controls.



Insulating Pad

(22) *Anderson Electric Corp., P.O. Drawer 2151, Birmingham, Ala.*

A new self-bonding wrap-around insulation for compression connectors is now being offered by Anderson Electric.

Produced under the brand name Insta-Seal, the insulation is said to be highly flexible, nonsticky and capable of being applied much quicker than tape.

Snap Strap

(23) *Holub Industries Inc., Sycamore, Ill.*

Installation of pipe, thinwall and rigid conduit is simplified by the new line of Two-Hole straps announced by this company. They are made of No. 3 semispring steel and snap on the conduit leaving both hands free for nailing.

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana

BULLETINS ETC.

(24) LADDER MOUNTS—A four-page bulletin on the HDG ladder mount is available from H. K. Porter Co., Delta-Star Electric Division, at 2437 Fulton St., Chicago 12, Ill.

(25) LIGHTING—An industrial incandescent lighting catalog has been published by Benjamin Division of Thomas Industries, and may be secured by writing for bulletin G to the manufacturer's advertising department, 207 E. Broadway, Louisville, Ky.

(26) SWITCHES—Installation and application data on its line of fuse panels, service entrance equipment and switches are contained in a 20-page publication from the Clark Controller Co., American Electric Switch Division, 1146 E. 152nd St., Cleveland 10, Ohio. Write for publication No. PL 12-29-660.

(27) PLASTIC TUBING—Fanner Mfg. Co., Electrical Products Division, has issued a new catalog section on its line of plastic tubing for protection of wires, strands and conductors. Request catalog section TU, from the manufacturer at Brookside Park, Cleveland 9, Ohio.

(28) SCHOOL HEATING—A four-page bulletin available from Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., covers installations and specifications for heating schools electrically. Specify bulletin F00101-1.

(29) MOTOR RUN CAPACITORS—John E. Fast & Co., 3598 N. Elston Ave., Chicago 18, Ill. is offering a bulletin on motor run capacitors for air conditioning, refrigeration, fluorescent lighting ballast and similar uses.

(30) POWER SYSTEMS—GEA Bulletin 7139, Better Power for Production, outlines principles of planning industrial power distribution systems. There are chapters on choosing voltages, short circuit calculations, protective relaying, selection of unit substations and similar information. It is available from General Electric Co. at Schenectady 5, N. Y.

(31) LOAD TAP CHANGERS—Information about bushing mounted load tap changing (LTC) equipment for large power transformers, 120,000 kva and above, is contained in a four-page bulletin No. GEA—7133. Available from General Electric Co., Schenectady 5, N. Y.

(32) POTHEADS—G & W Electric's bulletin AA56 is a price list and discount sheet covering its type ST-Sodertite pothead. Write G & W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill.

(33) TRANSFORMERS—Of interest to engineers and electrical contractors is a bulletin covering transformers and substation equipment offered by Sorgel Electric Co., 838 W. National Ave., Milwaukee 4, Wis. Ask for brochure No. 960.

(34) FURNACE TRANSFORMER—Electric furnace transformers are covered in a 16-page booklet released by Pennsylvania Transformer Division, McGraw-Edison Co. For a copy of this bulletin, PFT3M960, write on company letterhead to the manufacturer's power sales department, Box 330, Canonsburg, Pa.

(35) DICTIONARY—A pocket-size, 22-page glossary intended to make computer language more intelligible to the layman is offered under the title "Do You Talk 'Computerese'?" by the Brown Instruments Division of Minneapolis-Honeywell Regulator Co. Copies may be secured from the manufacturer at Wayne and Windrim Aves., Philadelphia, Pa.

(36) LINE CONSTRUCTION—Petersen Engineering Co., Santa Clara, Calif., has prepared data sheets on its 5000-U Bullwheel Tensioner Assembly; new hydraulic-lift reel carriers featuring hand-activated self-loading and unloading service; the 6000 STR-1 Tensioner, a combination tensioner and reel dolly for transmission work and featuring the hand-activated self-loading and unloading device. Two revised bulletins cover the PENGO portable 4000 Pole Mount Tensioner and the 5000 STR-1 and 5500 BWCP combination.

(37) SWITCHGEAR—A new bulletin describing its completely redesigned line of 4,160-v metal-clad switchgear is offered by I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30, Pa.

(38) HEAT COMPUTER—For primary electric heat system distributors, architects, contractors and engineers, this heat computer is designed to help in figuring heat loss and cost for electrically heated homes and other buildings. It shows wattage loss for six significant areas, and contains charts showing outside design temperatures throughout the country and an annual degree-day map. A booklet accompanying the computer gives instructions for its use. The two may be secured from Electric Heat Division, Arvin Industries Inc., Columbus, Ind.

(39) SLIDE RULE—A new slide rule chart listing complete string flashover values for EEI-NEMA and fog-type suspension insulators is available from the Lapp Insulator Co. Inc., Le Roy, N. Y.

(40) CONVERSION FACTORS—A reference table in wall chart form has been published by Precision Equipment Co., 4411E Ravenswood Ave., Chicago 40, Ill. Included are common conversions such as inches to centimeters or watts to hp, as well as others that are difficult to locate in reference manuals.

(41) HIGH-VOLTAGE DISTRIBUTION—Two new bulletins from Line Material Industries cover equipment designed for 20/34.5-kv distribution systems as well as typical construction drawings employed by major utilities. Bulletin 60118 includes data on arresters, cutouts, transformers and insulators, and other equipment applicable to the system. Bulletin 60119 includes construction drawings and bill of materials for typical line poles and transformer and capacitor installations. These bulletins may be secured from L-M field engineers or from headquarters, Milwaukee 1, Wis.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST *Not good*
68 Post St., San Francisco 4, Calif. *after February 1*

Please send me, without obligation, the new product information or catalogs.

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JOSLYN
welded screw
ANCHORS

STRONGEST—Helix is welded to the high-strength rod by carefully-controlled new technique; weld is tough, ductile, and stronger than the base metal.

EASIEST TO INSTALL—Minimum torque is required for hand or power installation because of:

1. Scientifically correct angle of the helix which causes minimum earth disturbance.
2. Sharp, knife-like cutting edges of the helix, which bite into the soil.
3. Chisel point, which bores a lead hole and works its way around rocks and other obstructions.

LONGEST LIFE—Entire anchor (rod and welded helix) is hot dip galvanized after fabrication to insure maximum resistance to corrosion.

MOST READILY AVAILABLE—Stocks in sizes from 4" to 15" in diameter are maintained in Joslyn Warehouses.

JOSLYN COMPLETE POLE LINE EQUIPMENT

JOSLYN MFG. AND SUPPLY CO.

155 N. WACKER DRIVE • CHICAGO 6, ILLINOIS

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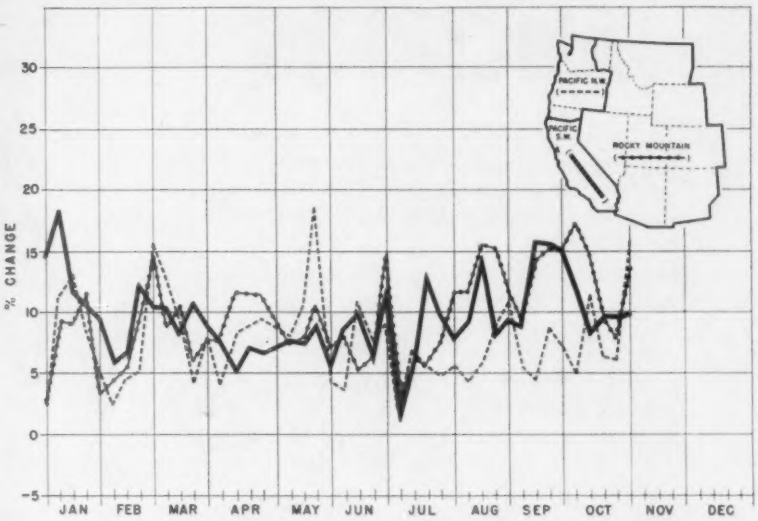
WESTERN BUSINESS TRENDS &

Output Comparisons

Year-to-Year Kwh Output Changes. Per Cent Change Over Same Week One Year Ago for Region as Indicated in Keyed Map



Electrician's Wage Scale

Shown are union hourly wage scales for electricians in selected cities in the 11 Western states. These scales represent the minimum wage rates (excluding holiday and vacation payments, regularly made or credited to the worker each pay period) agreed upon through collective bargaining

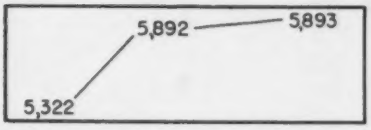
Relative Wholesale Prices of Electrical Material

	Latest Month	Previous Month	Year Ago
Wire & cable	131.3	131.3	133.5
Watt-hour meters	120.9	120.9	120.9
225-hp motors	202.8	227.9	223.9
Hydro generators	185.5	185.5	198.5
Steam generators	203.5	203.5	203.5
15-kva transformers	133.0	133.2	133.5
500-kva transformers	147.1	147.1	160.0
Switch & fuse panelboard	132.4	132.4	132.4
Circuit breaker panelboard	136.7	136.7	139.1

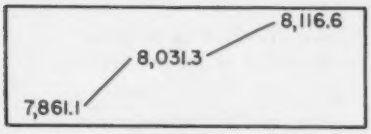
INDICATORS

Economy at a Glance

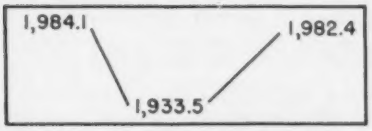
Year Ago	Last Month	This Month



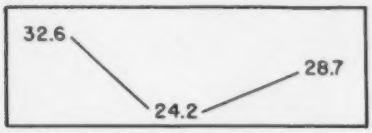
PERSONAL INCOME in millions—seasonally adjusted as of Nov. 15 (An index of consumer spending potential)



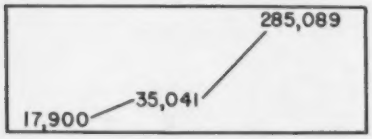
NONFARM EMPLOYMENT in thousands (An index of total industrial and commercial activity)



MANUFACTURING EMPLOYMENT in thousands (A measure of manufacturing activity)



HOUSING STARTS in thousands of units (Index of new residential customers)



INDUSTRIAL BUILDING CONTRACTS in thousands of dollars (A rough index to the dollars of electrical contracting business six months to a year ahead)

► Pay scales of union building trades workers were reported to have advanced an average of 0.4% during the three months ending Oct. 1, 1960, according to the United States Bureau of Labor Statistics quarterly survey of seven major building trades in 100 cities. This increase, while slightly smaller than the 0.6% rise in the corresponding quarter of 1959, equaled the gain registered in the same period of 1958.

Sources: Business Week, Bureau of Labor Statistics, Construction Daily and Engineering News-Record

Keeping line clearance costs DOWN goodwill UP

Proven power equipment and Davey trained rope climbers... that's what makes Davey Surgical Line Clearance so economical. Utilities can rely on the dependable, efficient, and *adaptable* Davey crew. It will pay you to talk over your tree maintenance problems with the West's leading line clearing specialists—Call Davey.

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SAN FRANCISCO • Russ Building
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New *Subscription* Rates for Electrical West

Effective Jan. 1, 1961

	U. S. and U. S. Possessions	Canada	Latin America and Philippine Islands	Foreign
1 year	$3.00	$4.00	$ 6.00	$10.00
2 years	5.00	5.00	10.00	15.00
3 years	6.00	7.00	12.00	20.00

All New or Renewal Orders Received Before Jan. 1, 1961, will be accepted at present rates

SAVE MONEY—ORDER NOW!!

ELECTRICAL WEST

68 Post St. **San Francisco 4, Calif.**

Estimator's Guide

Prices shown are for new construction cost in place. Quotations furnished by LeRoy Construction Service

The figures in this guide, furnished by LeRoy Construction Service, will be kept up to date and published periodically. This guide is for your use. Will you please let the editor know if there are other figures or ideas which would make this section more valuable to you?

Residential Wiring

PER OUTLET, 120 V—2 WIRE		
Knob & tube	Each	8.50
Nonmetallic cable	Each	8.00
Armored cable (BXL)	Each	16.00
EMT	Each	20.00
Conduit rigid	Eeach	23.00
PER OUTLET, 230 v—3 Wire (RANGE—OVEN—WALL HEATER)		
Nonmetallic cable (Romex)	Each	14.00
Flex conduit (Greenfield)	Each	22.00
EMT	Each	23.00
SERVICE & PANEL		
Light panel & service		
50 amp lugs 120/240 v—3 wire		
4 1 pole circuit, 15 amp fused		70.00
Light panel & service		
100 amp ACB 120/240 v—3 wire		
4 1 pole circuit, 15 amp		
2 2 pole circuit, 20 to 50 amp		150.00
Light panel & service		
100 amp—ACB 120/240 v		
6 1 pole circuit, 15 amp		
3 2 pole circuit, 20 to 50 amp		165.00
Light panel & service		
100 amp—ACB 120/208 v, 3 phase, 4 wire		
8 1 pole circuit, 15 amp		
2 2 pole circuit, 20 to 50 amp		
2 3 pole circuit, 15 to 30 amp		225.00
(Required for air conditioning system)		
INSTALL LIGHT FITURES (Fixtures Purchased on Allowance)		
Incandescent	Each	4.00
Fluorescent	Each	5.00
Yard light	Each	5.00
Bathroom exhaust fan	Each	50.00
Garden pedestal light fixture	Each	40.00

Commercial Wiring—Conduit

RIGID GALVANIZED	Per C
½"	49.00- 54.00
¾"	62.00- 68.00
1"	79.50- 87.00
1¼"	103.00-115.00
1½"	121.50-132.00
2"	160.00-175.00
2½"	229.00-252.00
3"	298.50-325.00
3½"	365.50-401.00
4"	417.50-456.00
5"	624.50-685.00

Commercial Wiring—EMT

	Per C
½"	34.50- 38.00
¾"	43.50- 48.00
1"	58.00- 64.00
1½"	83.00- 90.00
1¼"	70.50- 76.00
2"	103.00-112.00

Commercial Wiring—RHW

WIRE 600 V—75°	Per M
750 mcm, stranded	2,011.00-2,090.00
700 mcm, stranded	1,867.00-1,940.00
600 mcm, stranded	1,675.00-1,742.00
500 mcm, stranded	1,401.00-1,457.00
400 mcm, stranded	1,140.00-1,185.00
300 mcm, stranded	923.00- 960.00
250 mcm, stranded	830.00- 860.00
No. 4/0, stranded	690.00- 717.00
No. 3/0, stranded	567.00- 589.00
No. 2/0, stranded	451.00- 965.00
No. 1/0, stranded	378.50- 393.00
No. 1, stranded	322.50- 335.00
No. 2, stranded	240.00- 249.00
No. 4, stranded	182.50- 190.00
No. 6, stranded	137.00- 142.00
No. 8, stranded	106.50- 110.00
No. 10, stranded	80.50- 83.00
No. 12, stranded	66.00- 68.00
No. 14, stranded	57.00- 59.00
No. 8, solid	99.00- 102.00
No. 10, solid	75.00- 78.00
No. 12, solid	61.00- 63.00
No. 14, solid	52.50- 54.00

Commercial Wiring—TW

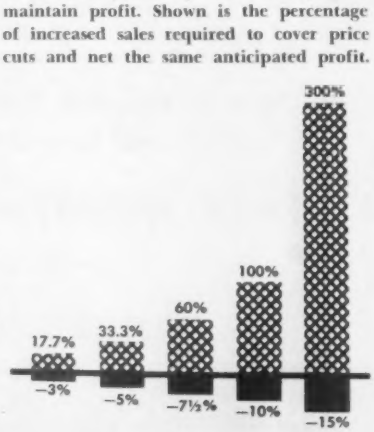
WIRE 600 V—75°	Per M
750 mcm, stranded	1,850.00-1,924.00
600 mcm, stranded	1,537.00-1,593.00
500 mcm, stranded	1,300.00-1,350.00
400 mcm, stranded	1,017.00-1,057.00
300 mcm, stranded	850.00- 882.00
250 mcm, stranded	750.00- 780.00
No. 4/0, stranded	635.50- 660.00
No. 3/0, stranded	543.00- 564.00
No. 2/0, stranded	432.50- 449.00
No. 1/0, stranded	356.50- 370.00
No. 1, stranded	306.00- 318.00
No. 2, stranded	227.00- 236.00
No. 4, stranded	173.00- 179.00
No. 6, stranded	129.50- 134.00
No. 8, stranded	95.00- 98.00
No. 10, stranded	73.00- 75.00
No. 12, stranded	59.50- 61.00
No. 14, stranded	51.50- 53.00
No. 8, solid	87.00- 90.00
No. 10, solid	68.00- 70.00
No. 12, solid	55.00- 57.00
No. 14, solid	47.50- 49.00

Commercial—Outlets & Connections

Conduit and wire not included	Each
Light fixture outlet	
Recess	8.00
Surface	7.00
WP	8.00
Duplex outlet	
15 amp	9.00
15 amp WP	10.00
Clock outlet	9.00
Floor outlet, flush	17.00
Floor outlet, pedestal type	23.00
Outlet, 240 v, 3 wire, 1 phase, 30 to 50 amp	13.00
Outlet, 240 v, 4 wire, 3 phase, 30 to 50 amp	16.00
Switch, single pole	9.00
Switch, double pole	10.00
Switch, 3 way	10.00
Switch, single pole w/pilot	12.00
Switch, momentary contact	10.00

Cut My Price?

NECA says, if you anticipate cutting your price in order to increase sales volume, look at the task you set yourself in trying to maintain profit. Shown is the percentage of increased sales required to cover price cuts and net the same anticipated profit.



Motor Outlet & Connection

GREENFIELD FLEXIBLE CONDUIT	Each
Fractional hp, 120 v, 1 phase	11.00
Fractional to 3 hp, 240 v, 3 phase	13.00
5 to 10 hp, 240 v, 3 phase	14.50
15 to 25 hp, 240 v, 3 phase	18.00
30 to 50 hp., 240 v, 3 phase	26.50
60 to 100 hp, 480 v, 3 phase	35.00
For Sealtite add 25%	
For explosionproof add 50%	

Power & Control Equipment

MOTOR DISC. SWITCH TYPE C NONFUSIBLE STD. DUTY 230 V	Each
30 amp, 2 pole, 240 v	19.00
30 amp, 3 pole, 240 v	21.50
60 amp, 3 pole, 240 v	34.00
100 amp, 3 pole, 240 v	52.00
200 amp, 3 pole, 240 v	84.50
400 amp, 3 pole, 240 v	178.00
600 amp, 3 pole, 240 v	280.00
30 amp, 3 pole, 575 v	22.00
60 amp, 3 pole, 575 v	36.00
100 amp, 3 pole, 575 v	54.00
200 amp, 3 pole, 575 v	88.00
400 amp, 3 pole, 575 v	184.00
600 amp, 3 pole, 575 v	290.00
PUSHBUTTON STATION	
NEMA 1, std. duty	
One button	14.50
Two button	17.00
Three button	22.50
NEMA 1, heavy duty	
One button	20.00
Two button	27.00
Three button	34.00
NEMA 4 & 5, std. duty	
One button	32.50
Two button	34.00
Three button	38.50
NEMA 4 & 5, heavy duty	
One button	37.50
Two button	42.50
Three button	61.00
MOTOR STARTERS—MANUAL	
Size 00—1 pole, 120/208 v	17.00
Size 00—2 pole, 240/480 v	19.00
Size 0—2 pole, 240/480 v	32.00
Size 1—2 pole, 240/480 v	37.00
Size 0—3 pole, 240/480 v	41.00
Size 1—3 pole, 240/480 v	46.00
MOTOR STARTERS—MAGNETIC RESET ONLY IN COVER	
Size 0—2 pole, single phase	47.00
Size 1—2 pole, single phase	52.00
Size 1½—2 pole, single phase	67.00
Size 0—3 pole, 3 phase	55.00
Size 1—3 pole, 3 phase	60.00
Size 2—3 pole, 3 phase	107.00
Size 3—3 pole, 3 phase	173.00
Size 4—3 pole, 3 phase	365.00
MOTOR STARTERS—MAGNETIC START, STOP, RESET IN COVER	
Size 0—2 pole, single phase	56.00
Size 1—2 pole, single phase	62.00
Size 1½—2 pole, single phase	77.00
Size 0—3 pole, 3 phase	63.00
Size 2—3 pole, 3 phase	68.00
Size 2—3 pole, 3 phase	116.00
Size 3—3 pole, 3 phase	183.00
Size 4—3 pole, 3 phase	374.00
UNDERFLOOR DUCT SYSTEM	
Duct, No. 2, single run, including junction boxes and misc. ftgs., etc.	Per ft 2.90
Duct No 4, single run, including junction boxes and misc. ftgs. etc.	Per ft 3.20
Pedestal underfloor duct outlet, power	Each 16.50
Pedestal underfloor duct outlet, telephone	Each 14.00

PROPOSED WESTERN PROJECTS

Pacific Southwest

Marble Canyon, Ariz., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Wilcox, Ariz., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Buena Park, Calif., Luxury Homes Inc., 65 dwellings, $862,391.

Covina, Calif., Covina Valley Unified School District, nine elementary schools, two intermediate schools and two high schools, voted bonds $7,000,000 and $14 million state loan.

Culver City, Calif., City, modernize lighting, $300,000.

El Centro, Calif., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000; airport traffic control tower, $160,000.

El Segundo, Calif., El Segundo Unified School District, junior high school, voted bonds $4,500,000.

Garden Grove, Calif., Garden Grove School District, school, $400,000. Plans by Kistner, Wright & Wright, Los Angeles.

Garden Grove, Calif., Reynolds-Movius, 78 dwellings, $1,014,000.

Glendale, Calif., City, public works corporation yard, $1,250,000.

Hawthorne, Calif., Federal Aviation Agency—Los Angeles, airport traffic control tower, $160,000.

Los Angeles, Calif., County Board of Supervisors, distribution tunnel for Music Hall, $400,000. M. A. Nishkian, Long Beach, engineer.

Los Angeles, Calif., Federal Aviation Agency, terminal air traffic control center building, $1,900,000; instrument landing system $269,000.

Los Angeles, Calif., Hollywood Ardmore Inc., 12-story apartment, $4,000,000. In care of Robert C. Lesser, architect.

Newhall, Calif., Signature Homes, 1,500 dwellings, $15 million. Plans by L. C. Major & Associates, Downey.

Palm Springs, Calif., M. W. Blackstone & Associates, hotel and golf pro-shop, $1,000,000.

Palm Springs, Calif., Desert Hospital District, hospital additions, bond election $1,920,000.

San Diego, Calif., Federal Aviation Agency—Los Angeles, airport traffic control tower (Montgomery), $160,000.

San Diego, Calif., Federal Aviation Agency—Los Angeles, airport traffic control tower (Gillespie), $160,000.

Tarzana, Calif., Shadow Hills Bldg., 49 dwellings, $1,152,000. Plans by Ridgeley & Wexler, Encino.

Tustin, Calif., Brittany Village, 46 dwellings, $1,106,200.

Ventura, Calif., Ventura Union High School District, junior high school, $600,000. Plans by K. H. Hess.

Pacific Northwest

Bijou, Calif., Heavenly Valley Corp., hotel and two swimming pools, $1,500,000. In care of H. L. Aynedter, Tahoe Valley architect.

Hayward, Calif., State Division of Architecture—Sacramento, 300-room science building, $4,300,000; 182-room arts building, $2,300,000. Plans by Richard J. Neutra, Los Angeles.

Merced, Calif., Merced City Elementary School District, schools, voted bonds $1,150,000.

Modesto, Calif., Federal Aviation Agency—Los Angeles, airport traffic control tower, $160,000.

Moffett Field, Calif., National Aeronautics and Space Administration, mass transfer cooling and aerodynamics facility building. John Sardis & Associates, San Francisco, engineers.

Pittsburg, Calif., Pittsburg Unified School District, schools, voted bonds $3,000,000.

Richmond, Calif., Standard Oil Co. of California, chemical plant, $17 million.

Richmond, Calif., Safeway Stores Inc., distribution center, $4,000,000.

San Francisco, Calif., Trans-World Airlines, two-story satellite building, concourse and seven airplane parking areas, over $2,000,000. Plans by Welton Becket & Associates.

San Francisco, Calif., United Air Lines, passenger building expansion and addition, $2,000,000-$5,000,000.

San Mateo, Calif., San Mateo Union High School District, schools, voted bonds $3,900,000.

Stockton, Calif., San Joaquin County Housing Authority, 200-unit housing, $2,500,000. In care of Bissell & Eckland, architects.

Stockton, Calif., County, courthouse, voted bonds $5,500,000. Clowdsley & Whipple and Mayo de Wolf & Associates, architects.

Walnut Creek, Calif., Lincoln Development Co., 185-unit apartment, $2,850,000.

Arco, Idaho, Atomic Energy Commission, advanced test reactor, $24 million. Ebasco Services Inc., and Babcock & Wilcox Co., New York, consulting engineers; Phillips Petroleum Co., Tulsa, Okla., making conceptual design.

Boise, Idaho, School Board, junior high school, voted bonds, $805,000.

Boise, Idaho, Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Boise, Idaho, Stillwell-Pengilly Motel Co., 80-unit motel and swimming pool, $1,000,000. In care of Grider & LaMarche, architects.

Condon, Ore., U. S. Engineers—Seattle, air conditioning modifications, over $100,000; electrical distribution system, over $100,000.

Corvallis, Ore., U. S. Engineers—Seattle, conversion of Bomarc facilities, over $100,000; cathodic protection system, over $100,000; airmen's dormitory, over $100,000.

Klamath Falls, Ore., Federal Aviation Agency—Los Angeles, instrument landing system, $269,000.

Mt. Hebo, Ore., U. S. Engineers—Seattle, radar tower, over $100,000; water supply system, over $100,000; air conditioning modifications, over $100,000.

North Bend, Ore., U. S. Engineers Seattle, radar tower, over $100,000.

Portland, Ore., David Douglas School District, schools, voted bonds $1,839,500. Annand & Boone and Hayslip & Tuft, architects.

Bellingham, Wash., St. Joseph General Hospital, four-story hospital, $1,250,000. Plans by J. W. Maloney, Seattle.

Ft. Lawton, Wash., U. S. Engineers—Seattle, radar tower, over $100,000.

Longview, Wash., Reynolds Metal Co., aluminum reduction plant addition, $600,000.

Makah, Wash., U. S. Engineers—Seattle, radar tower, over $100,000; recreation facility, over $100,000; transmitter-receiver building, over $100,000.

Nacelle, Wash., U. S. Engineers—Seattle, radar tower, over $100,000.

Pullman, Wash., Washington State University, 10-story men's dormitory, $2,250,000.

Randle, Wash., North Pacific Plywood, Puget Sound Plywood Inc. and Anacortes Veneer, veneer mill, $500,000.

Seattle, Wash., U. S. Engineers, Nike Hercules system, over $100,000; Nike Hercules conversion, over $100,000.

Tacoma, Wash., City, municipal airport, $1,667,012. Worthen, Wing, Seifert & Forbes, consulting engineers.

Tacoma, Wash., United Building Co., 250 houses, $5,000,000. Plans by D. F. Burr.

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QUICKLY Installed
TOUGH For long life

EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

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Columbia 3, S.C.

Hawaii and Alaska

Anchorage, Alaska, Independent School District, voted bonds, junior high school, $1,750,000; elementary school, $960,000.

Anchorage, Alaska, City, expansion and improvement of telephone system, voted bonds $1,500,000.

Anchorage, Alaska, Lathrop Co., and Lease Co. Inc., eight-story office for General Services Administration, $2,000,000.

Bethel, Alaska, U. S. Engineers—Anchorage, radar towers, over $100,000.

Ft. Yukon, Alaska, Federal Aviation Agency—Anchorage, flight service station, $373,100.

Juneau, Alaska, Federal Aviation Agency—Anchorage, instrument landing system, $269,000.

Kotzebue, Alaska, U. S. Engineers—Anchorage, radar tower, over $500,000.

Sparrevohn, Alaska, U. S. Engineers—Anchorage, radar tower, over $100,000; water supply system, over $100,000; primary power modification, over $500,000.

Unalakleet, Alaska, U. S. Engineers—Anchorage, radar tower, over $100,000.

Ewa Beach, Hawaii, Blackfield Enterprises, 160 homes, $3,000,000.

Halawa, Hawaii, City and Honolulu County, firemen training center, $10,558,000.

Hilo, Hawaii, Realty Investment Co., shopping center, $1,000,000.

Hilo, Hawaii, Federal Aviation Agency—Honolulu, instrument landing system, $269,000.

Honolulu, Hawaii, Federal Aviation Agency, long-range radar, $2,400,000.

Honolulu, Hawaii, University of Hawaii, East-West center, $10 million appropriated by U.S. State Department. Mario Ciampi, San Francisco, consulting engineer.

Honolulu, Hawaii, Hawaiian Government Employees Assn., 11-story office, $1,000,000.

Honolulu, Hawaii, Alakea Parking Center, L-shaped extension office, $2,000,000. Plans by Laucomer Associates.

Kahului, Hawaii, Federal Aviation Agency—Honolulu, instrument landing system, $269,000.

Keaukaha, Hawaii, En Loy Kong, resort hotel, $3,000,000. Plans by Belt, Collins & Associates, Honolulu.

Pearl Harbor, Hawaii, Joseph R. Pao, 400 dwellings, $4,000,000. Plans by L. C. Major & Associates, Downey, Calif.

Waikiki, Hawaii, Mahiole Enterprises, 10-story cooperative apartment, $1,500,000.

Rocky Mountain

Denver, Colo., Federal Aviation—Los Angeles, instrument landing system, $269,000.

Lakewood, Colo., Jefferson County School District R-1, high school, $1,900,000. Plans by Alfred Watts Grant & Associates, Denver.

La Plata, Colo., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Pueblo, Colo., Jerry Aronoff, three-story apartments and swimming pool, $1,000,000.

Cut Bank, Mont., to Byron, Wyo., Continental Pipe Line Co., 433-mile crude oil pipe line, $13.5 million.

Dell, Mont., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Havre, Mont., Havre School District No. 16, high school, $1,932,375. Plans by Knight & Van Teylingen, Great Falls.

Lewiston, Mont., U. S. Engineers—Seattle, electrical distribution system, over $100,000.

Albuquerque, N. M., Dale Bellamah, 843 houses, $10 million.

Raton, N. M., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

Salt Lake City, Utah, Church of Latter Day Saints, 11-story archives, $8,000,000. Plans by Harold W. Burton, supervising church architect.

Casper, Wyo., First Casper Development Corp., hotel-motel, $2,000,000. Plans by Horace Brand Jr.

Cheyenne, Wyo., Procurement Office—Warren Air Force Base, 100-unit housing, $1,700,000. Plans by J. T. Banner & Associates, Laramie.

Cody, Wyo., Federal Aviation Agency—Los Angeles, long-range radar, $2,400,000.

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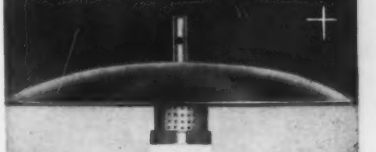

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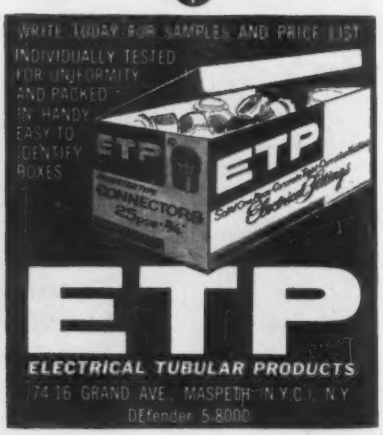
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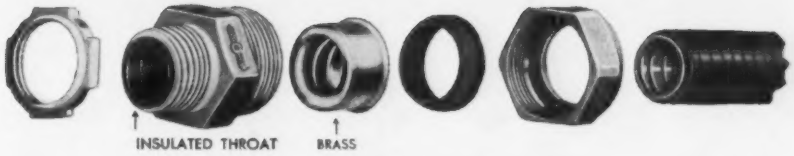

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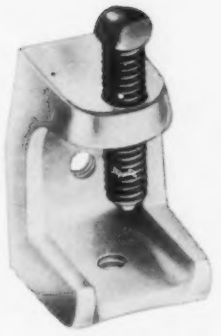

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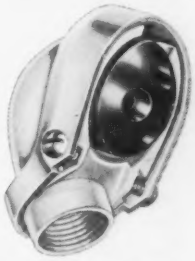

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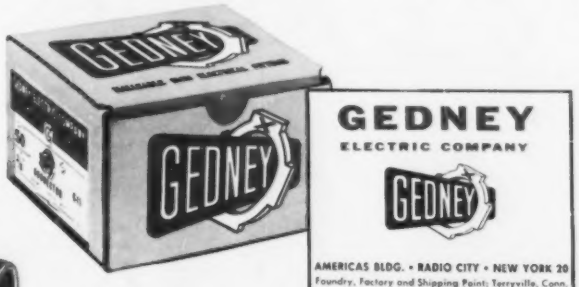

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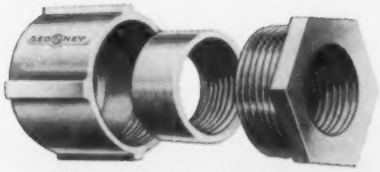

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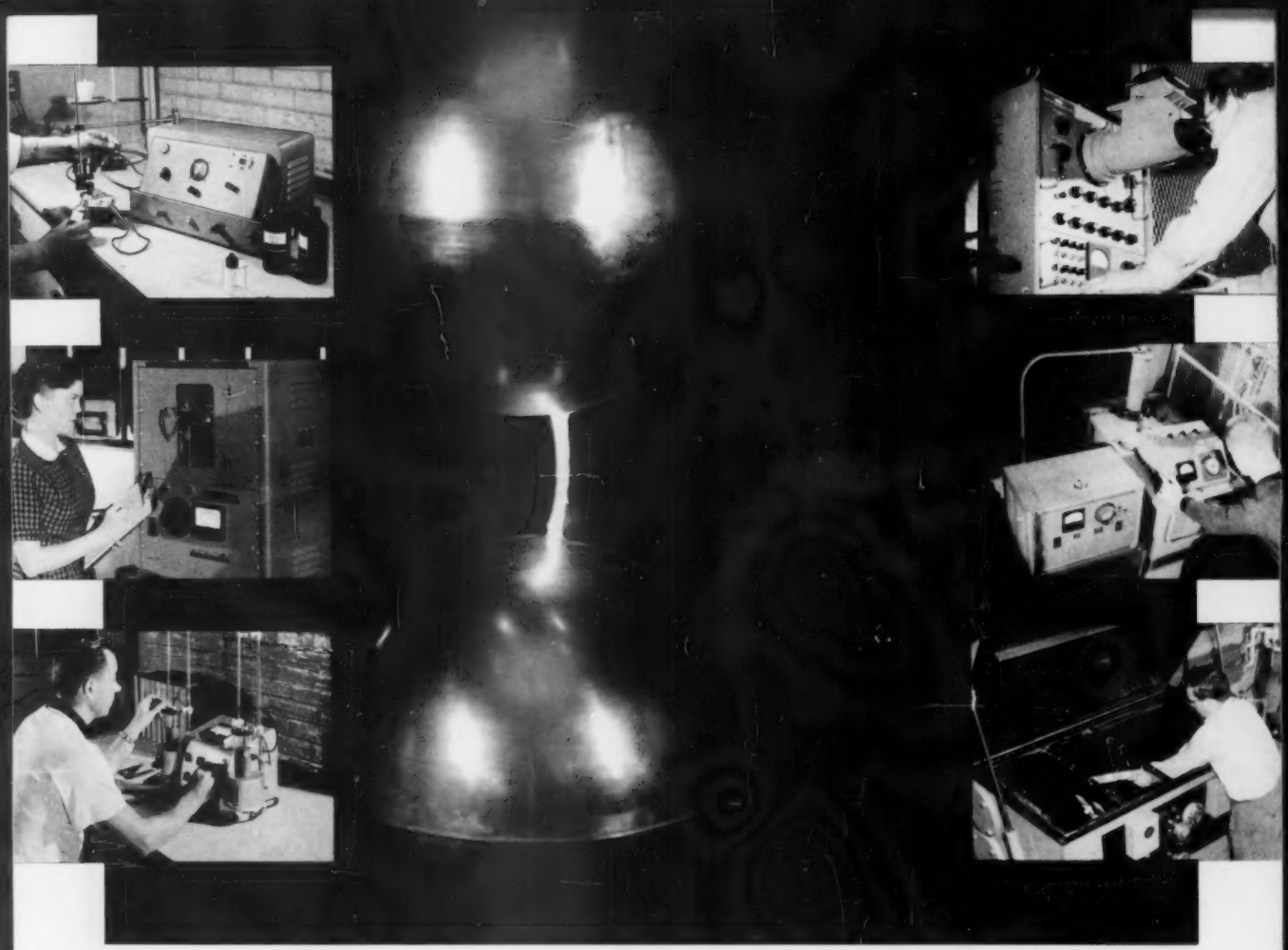

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